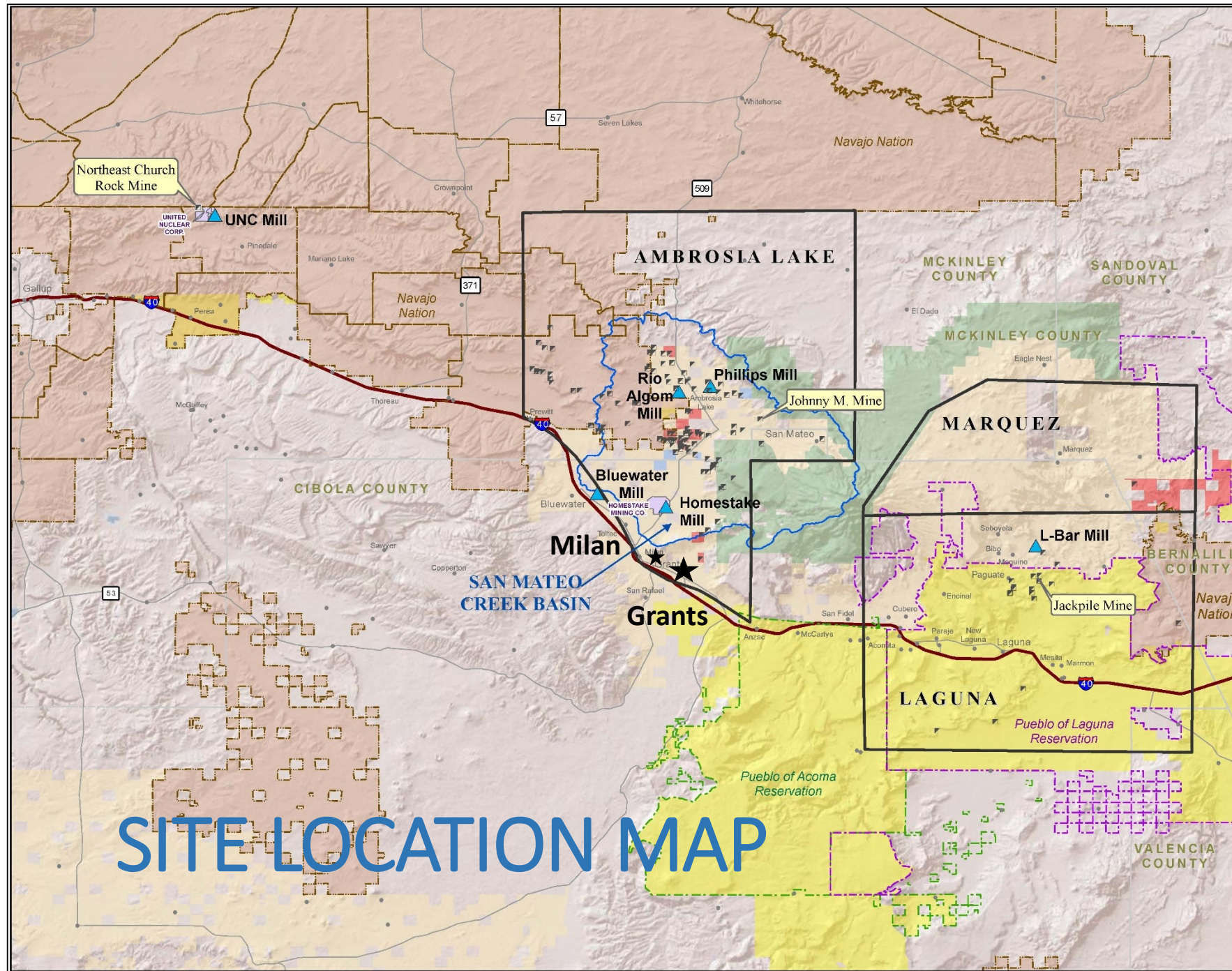


# TRONOX NAUM - SAN MATEO CREEK BASIN GROUNDWATER INVESTIGATION

July 27, 2017

Mark Purcell  
USEPA – Region 6



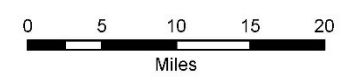
# SITE LOCATION MAP



- Uranium Mine
  - Mill Location
  - City or Town
  - Uranium Sub-District
  - Pueblo of Acoma
  - Pueblo of Laguna
  - Navajo Nation Chapter
  - Navajo Nation Ownership
  - San Mateo Basin
  - NPL Site
  - County
- Land Ownership for Tracts with Mines
- Bureau of Land Management
  - Forest Service
  - Tribal Land
  - Private Land
  - State Land

Note:  
The Land Ownership layer as displayed is not complete.  
The only areas displayed are those containing one or more mines.

Sources:  
MMD Legacy Uranium Mine Inventory: 12/2008.  
EPA Region 6 National Priorities List (NPL): 5/2015.  
Bureau of Land Management (BLM) Land Ownership.  
Navajo Land Department 2016. Census Bureau 2000  
TIGER/Line. ESRI World Shaded Relief.



EPA Region 6  
Superfund  
GIS Support  
04/25/2016



20160425MLO1








# SAN MATEO CREEK BASIN

 Navajo Land

 Legacy Uranium Mine

 Uranium Wet Mine

321 Square Miles

81 Mines Total

25 Wet Mines

4 Uranium Mills

Ambrosia Lake Area

Phillips Mill

Rio Algom Mill

DOE Anaconda Bluewater Mill Site

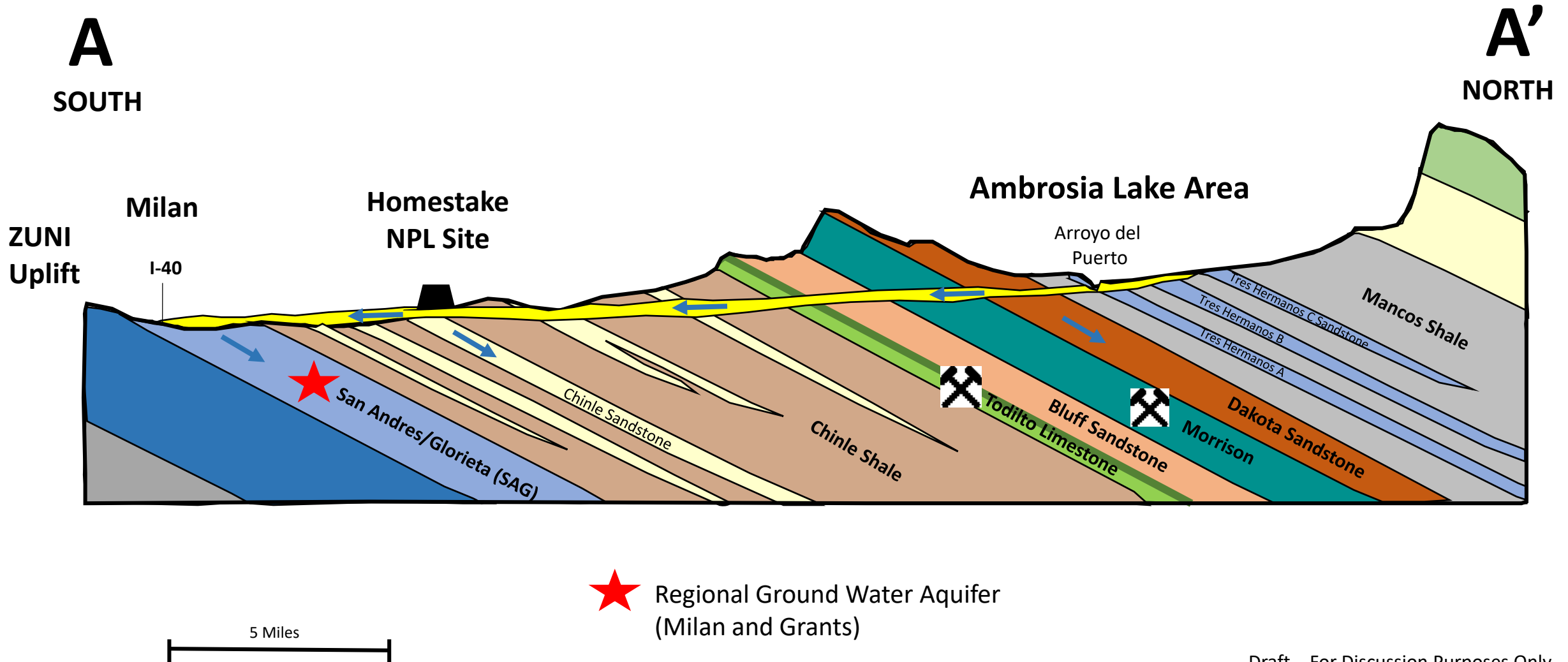
Homestake Mill  
NPL Site

San Mateo

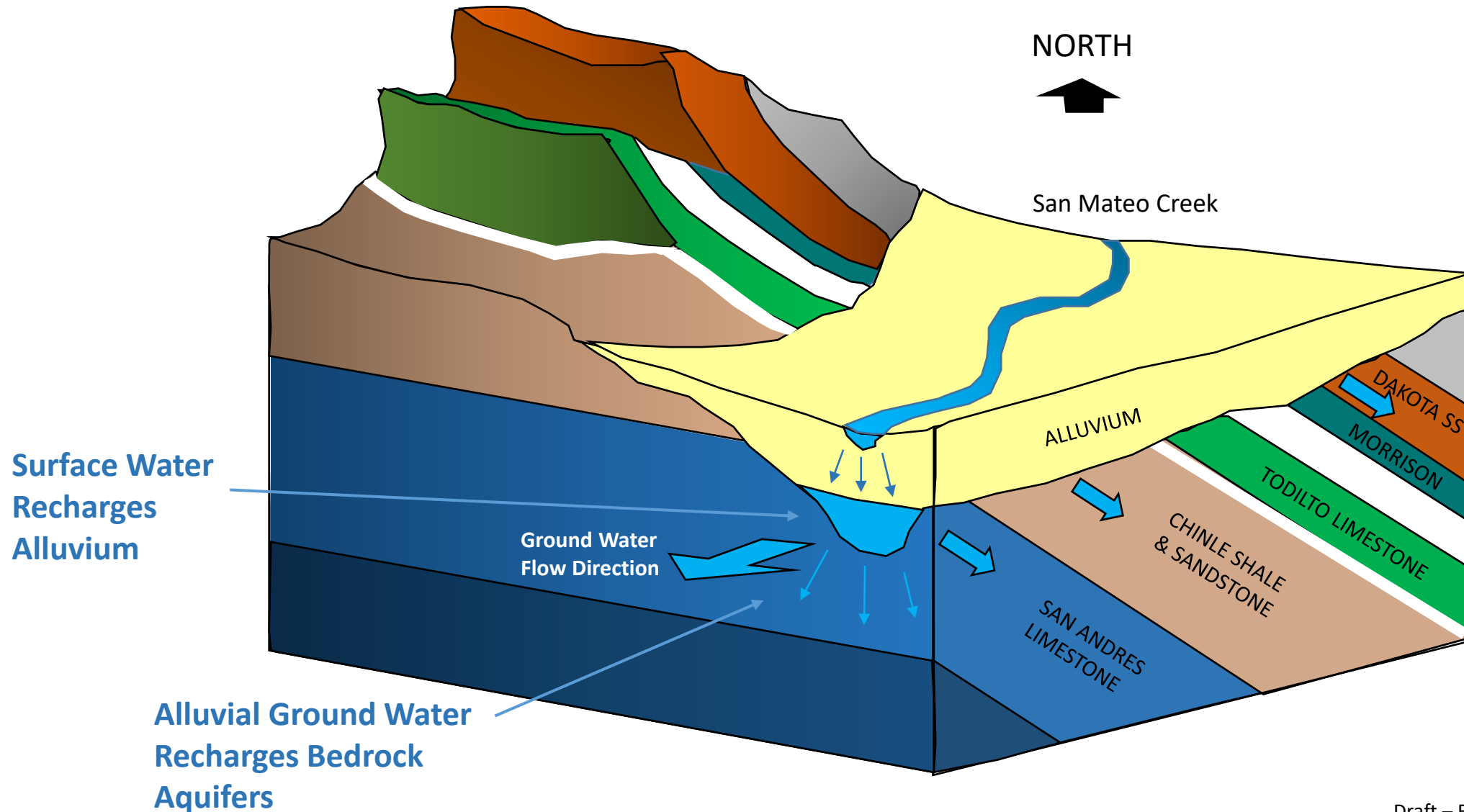
MT. TAYLOR

# CONCEPTUAL SITE GROUND WATER MODEL

## Generalized Cross Section Through San Mateo Creek Basin



# CONCEPTUAL SITE GROUND WATER MODEL

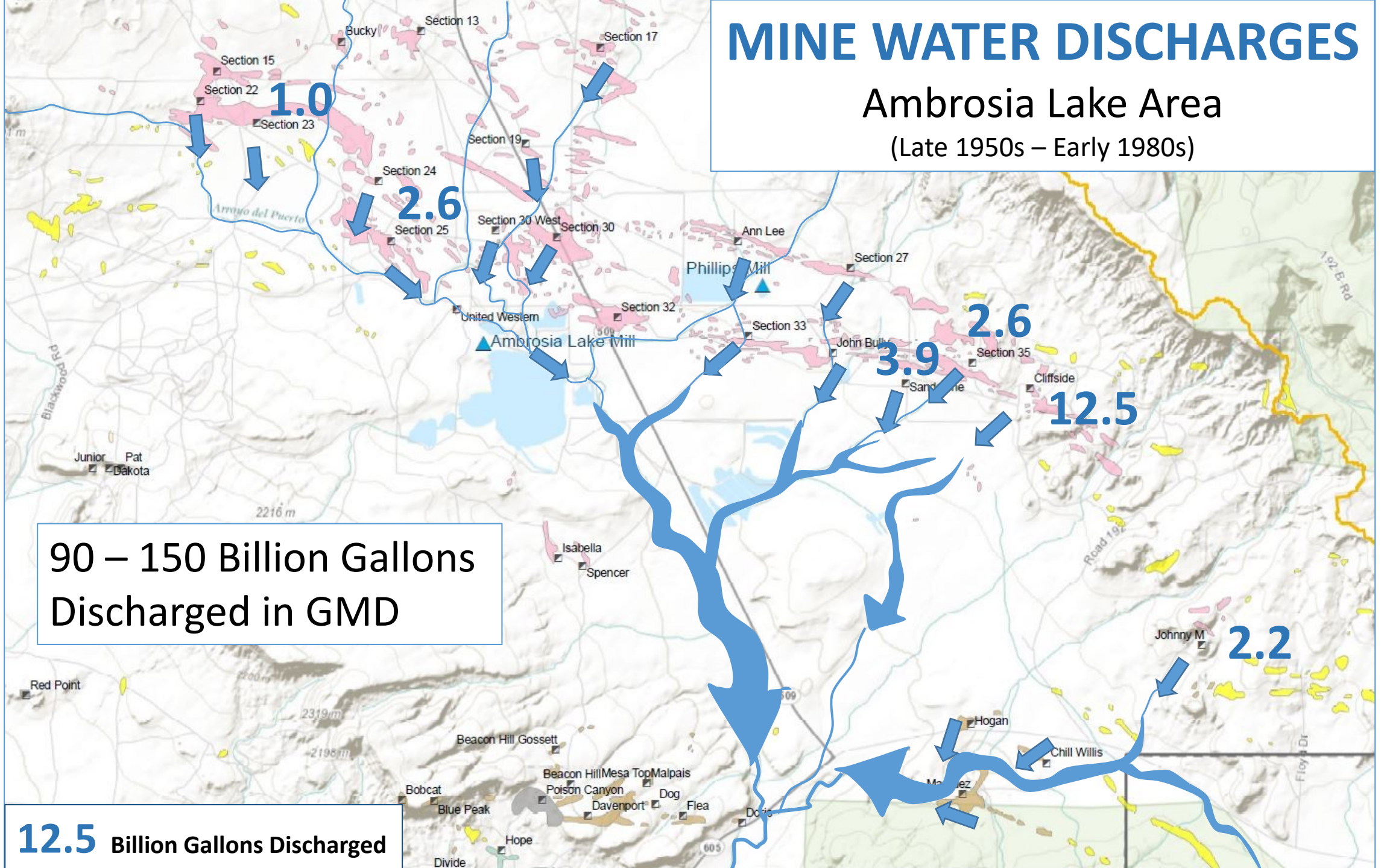




# MINE WATER DISCHARGES

## Ambrosia Lake Area

(Late 1950s – Early 1980s)



WHAT ARE IMPACTS TO BASIN FROM  
DISCHARGE OF MASSIVE VOLUMES OF MINE  
WATER?

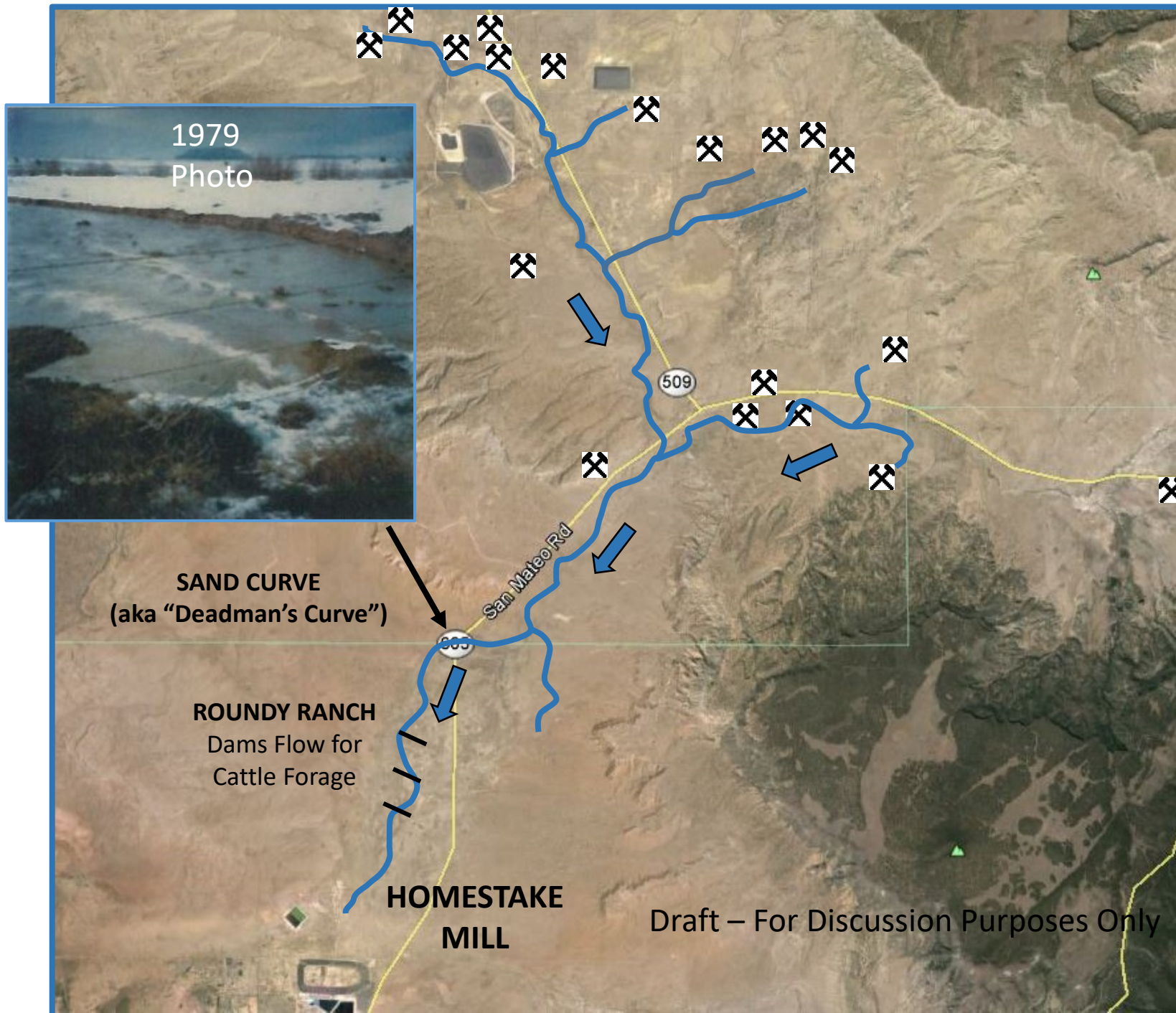


# SURFACE WATER IMPACTS

Discharge  
Artificially  
Created  
Perennial  
Surface Flow

May have reached  
Homestake  
Impoundment  
(EPA 1980)

 WET MINE



# SUMMARY OF HISTORIC MINE WATER DISCHARGE QUALITY

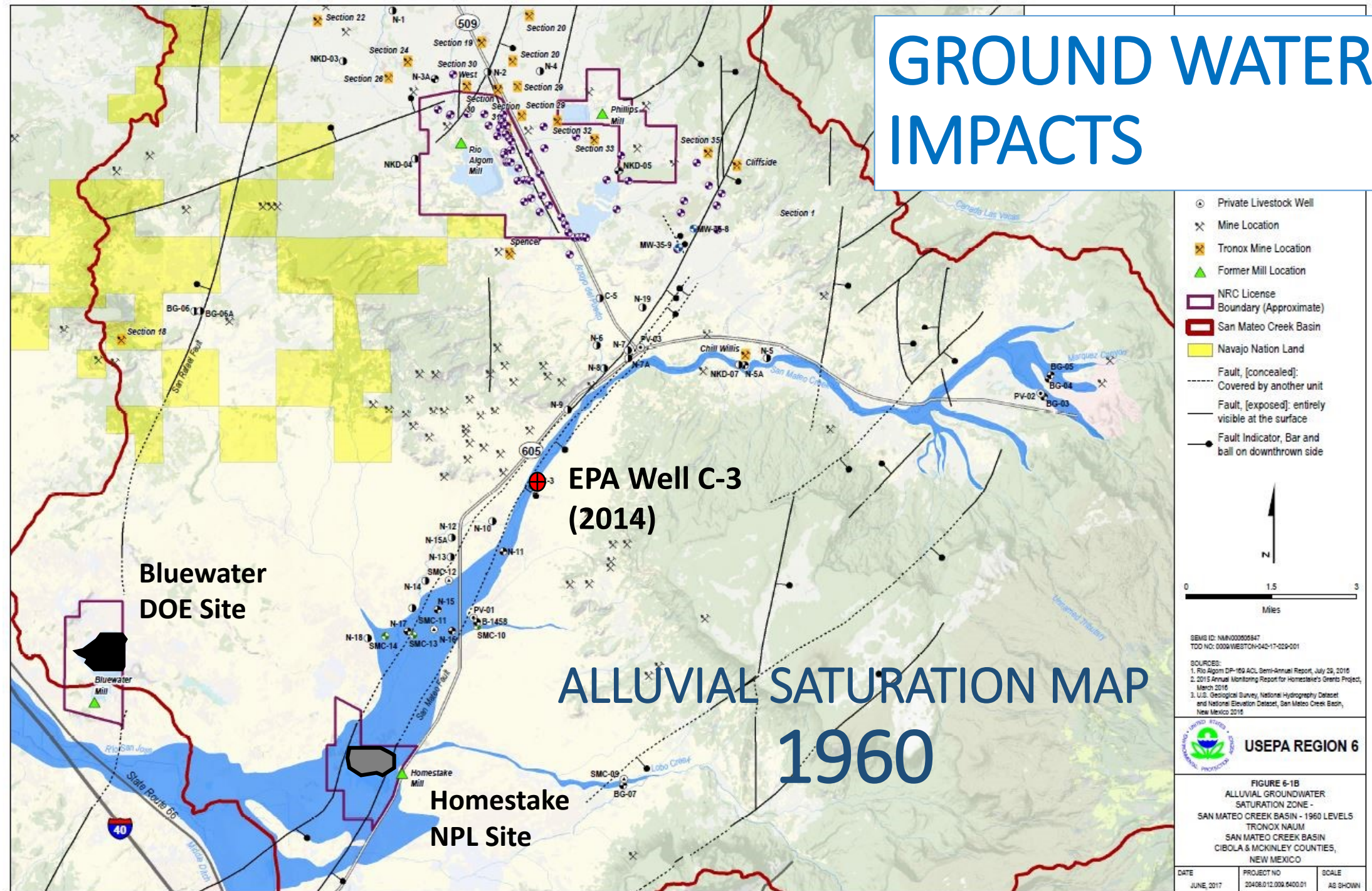
## And Comparison to Alluvial Background Water Quality

Contaminant	1981 Mine Water Discharge Ambrosia Lake Area	1981 Mine Water Discharge San Mateo Area	1978-80 San Mateo Creek Upland Alluvial GW (Background)
Gross Alpha (pCi/L)	580	1,100	2.5 – 15.0
Uranium (mg/L)	2.4	0.080	0.005 – 0.010
Selenium (mg/L)	0.410	0.040	0.005 – 0.005
Molybdenum (mg/L)	0.79	0.32	0.005 – 0.010
Chloride (mg/L)	90	10	3 – 8
Sulfate (mg/L)	837	205	5-20
Total Dissolved Solid (ppm)	1,690	520	125 – 300

New Mexico 1981 and 1986 Reports



# GROUND WATER IMPACTS



# CROSS SECTION A - A' CENTRAL SAN MATEO CREEK BASIN AREA

**A**

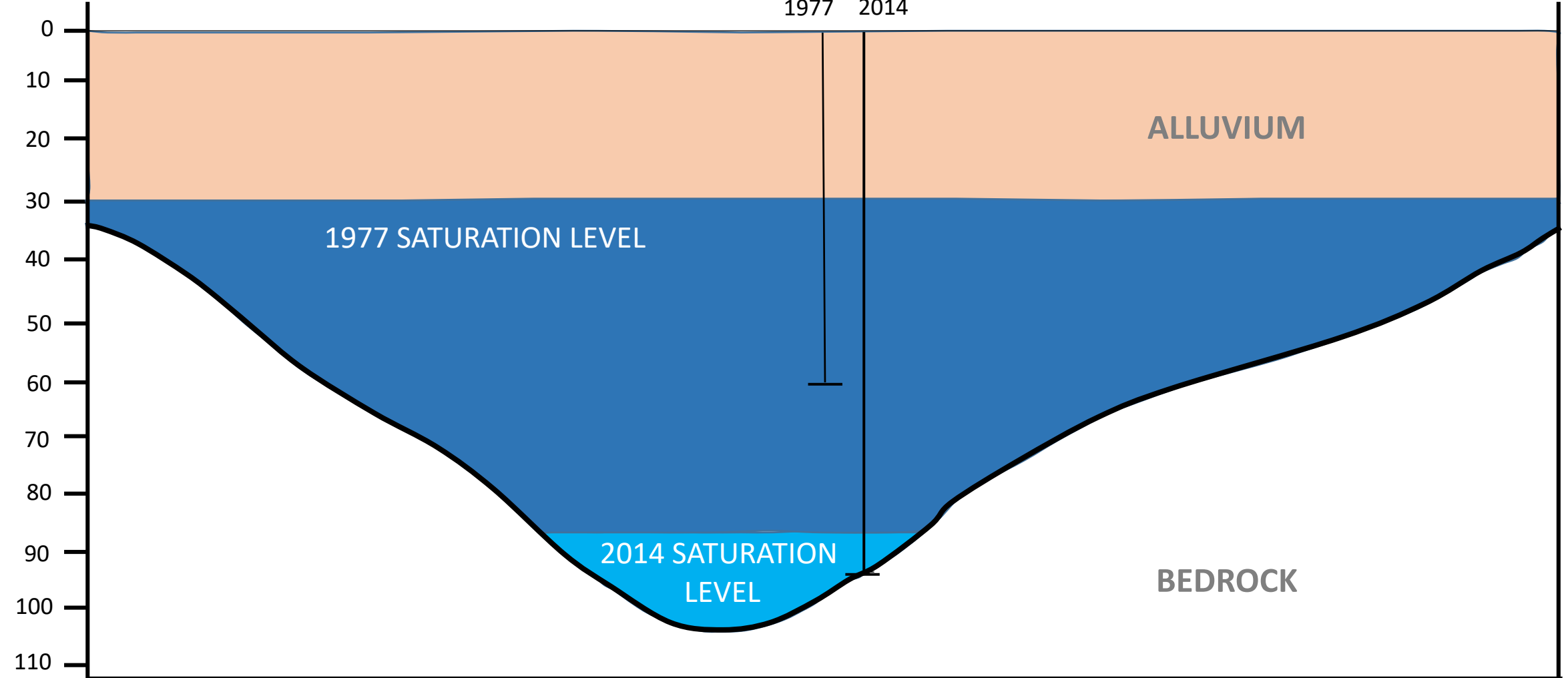
West

**A'**

East

Depth  
(ft)

NMED	EPA
Monitoring	Monitoring Well
Well	C-3
1977	2014

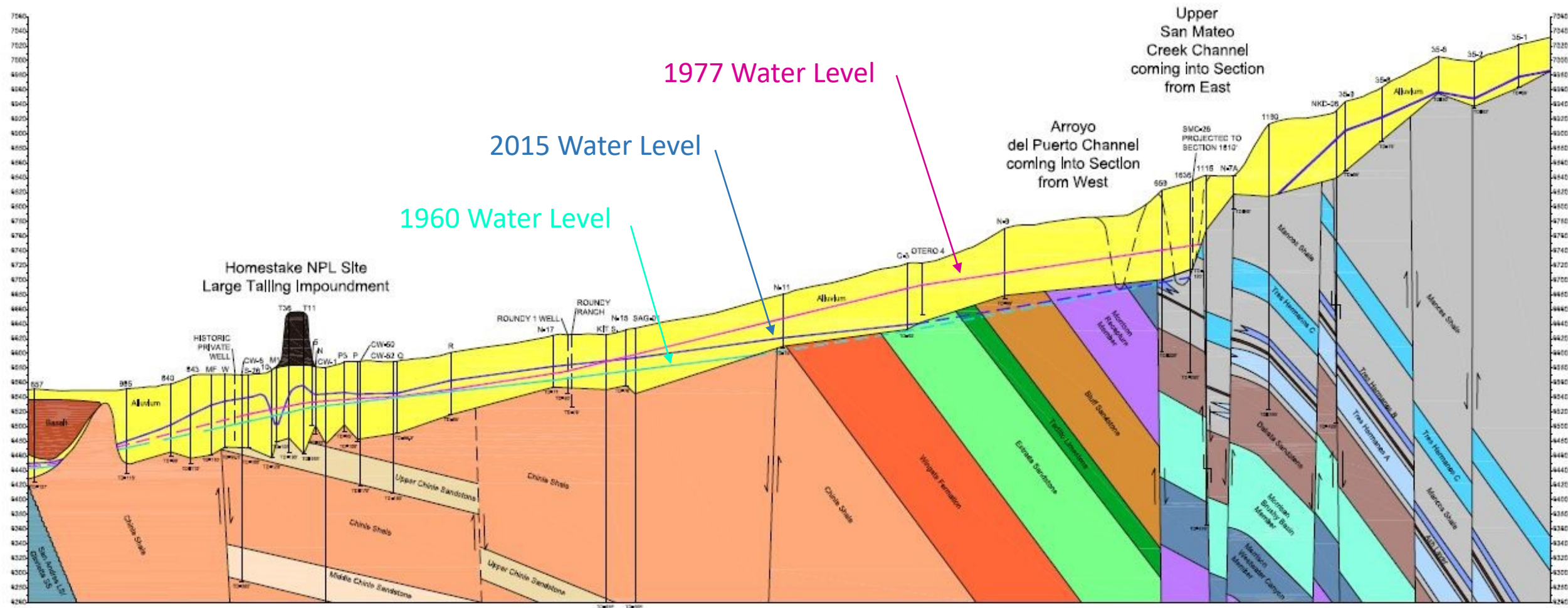




# HYDROGEOLOGIC CROSS-SECTION

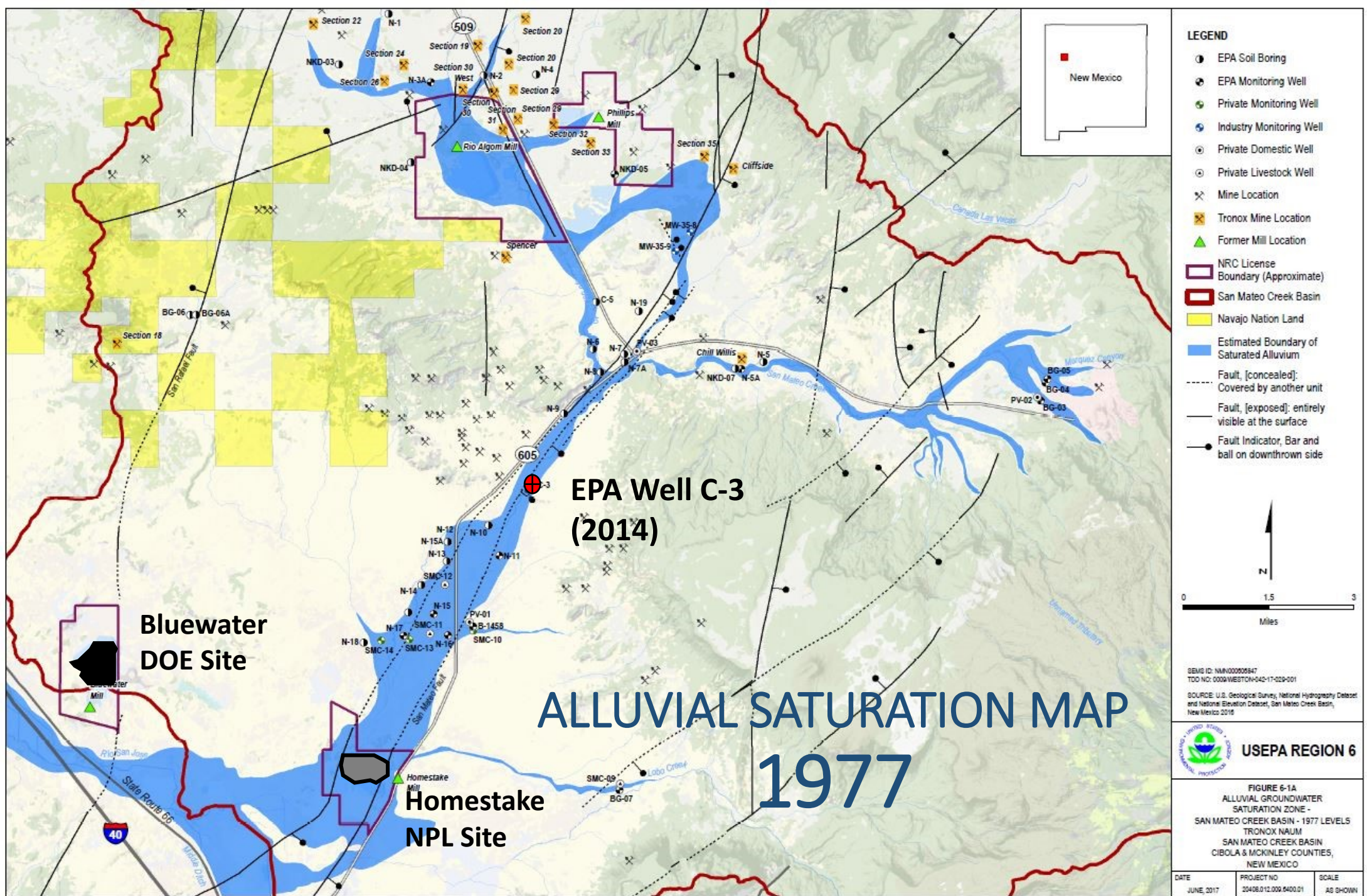
NO

NO

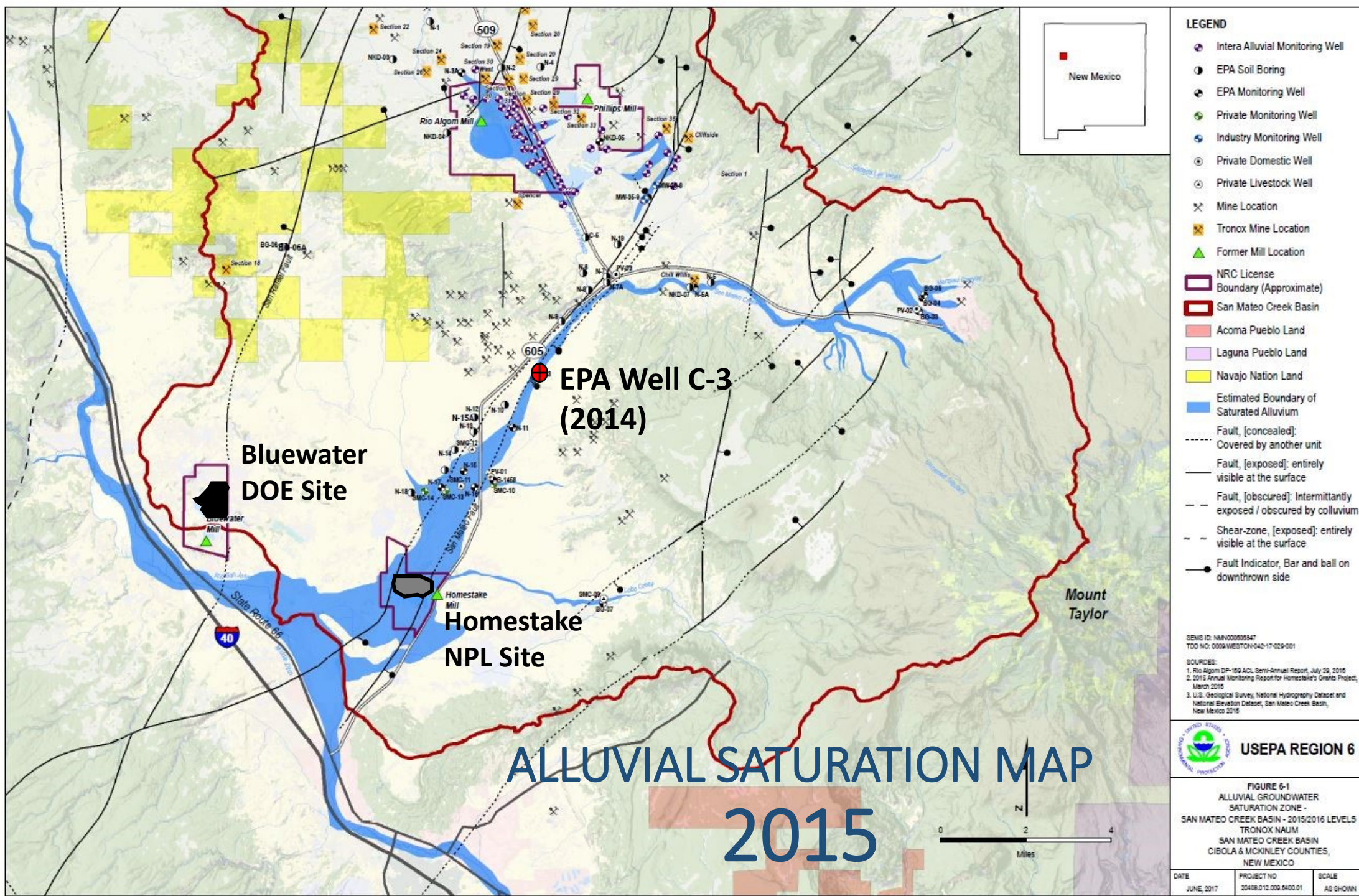


Draft – For Discussion Purposes Only



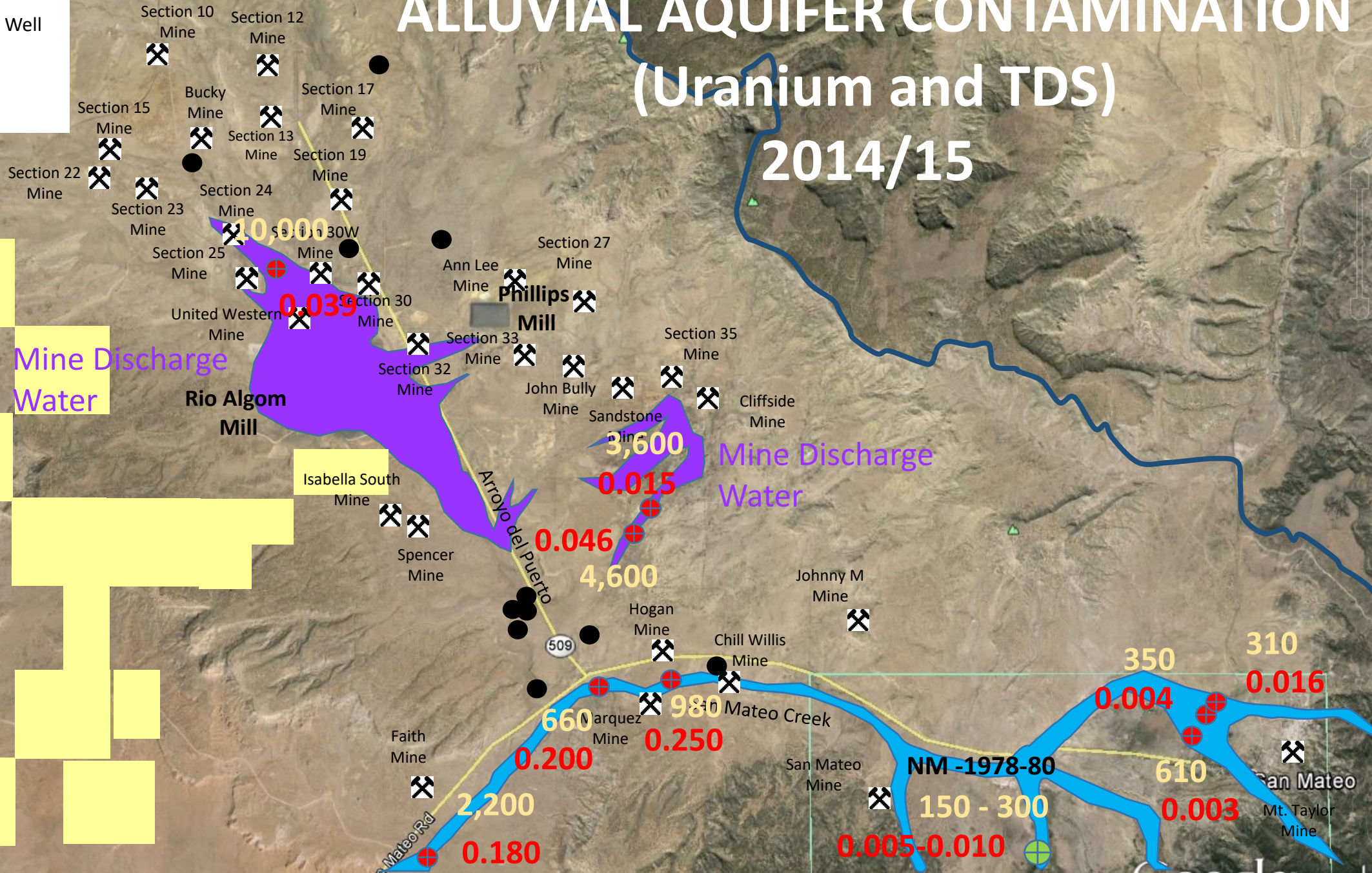






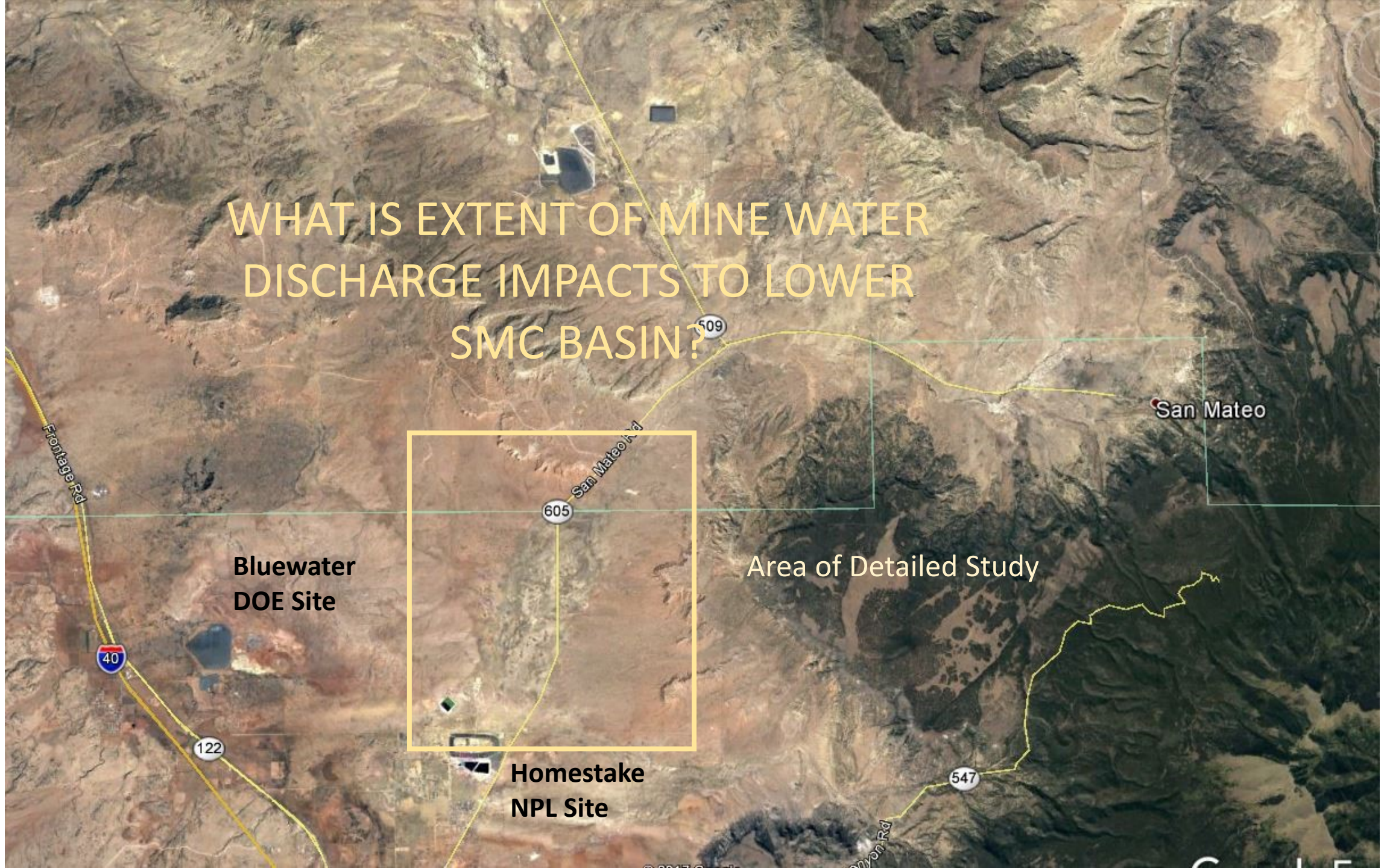


**N**





# WHAT IS EXTENT OF MINE WATER DISCHARGE IMPACTS TO LOWER SMC BASIN?



**Bluewater  
DOE Site**

Area of Detailed Study

**Homestake  
NPL Site**

San Mateo



[illegible]

-  EPA Monitoring Well
-  Private Monitoring Well
-  Industry Monitoring Well
-  Private Livestock Well
-  NRC License
-  Boundary (Approximate)
-  Homestake Impoundment
-  Evaporation Ponds
-  Groundwater Flow Direction
-  Groundwater Elevation Contour
-  Boundary of Alluvial Aquifer
- Base of Alluvial Structure
-  Contour 10-ft Interval
-  Contour 50-ft Interval

SMC-12	Well Designation(s)
950	
Roundy	
6589.3'	Groundwater Elevation in Feet
(56)	Year(s) of groundwater level measurement

NOTE:  
1. Groundwater elevation in feet

SEMS ID: NMND0805947  
TID NO: 0000WMTSTONLMD-17-000-001

SOURCE: U.S. Geological Survey, National Hydrography Dataset, San Mateo Creek Basin, New Mexico 2015



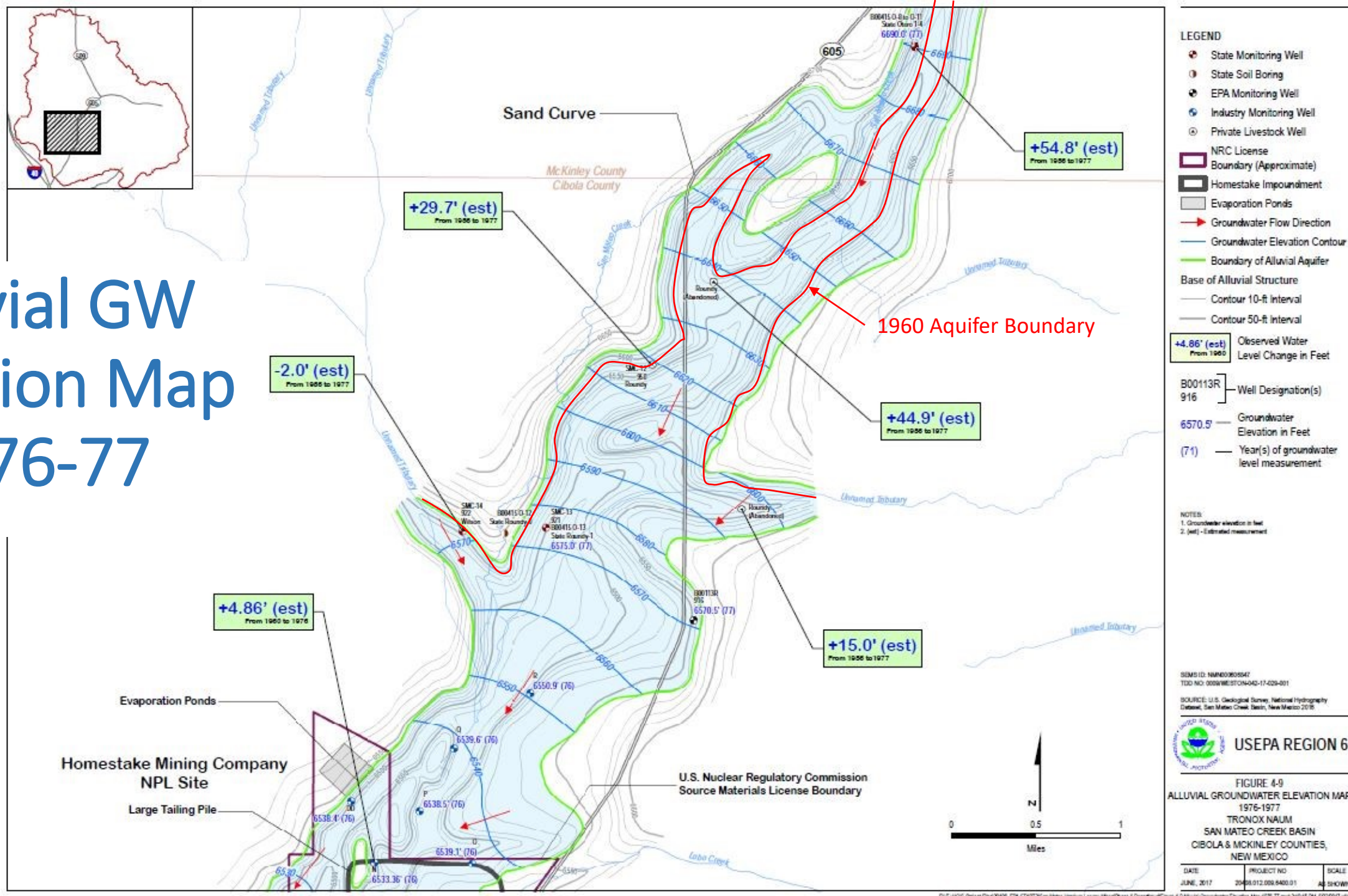
USEPA REGION 6

FIGURE 4-8  
ALLUVIAL GROUNDWATER ELEVATION MAP  
1956-1961  
TRONOX NAUM  
SAN MATEO CREEK BASIN  
CIBOLA & MCKINLEY COUNTIES,  
NEW MEXICO

DATE	PROJECT NO	SCALE
JUNE, 2017	20408.012.003.6400.01	AS SHOWN

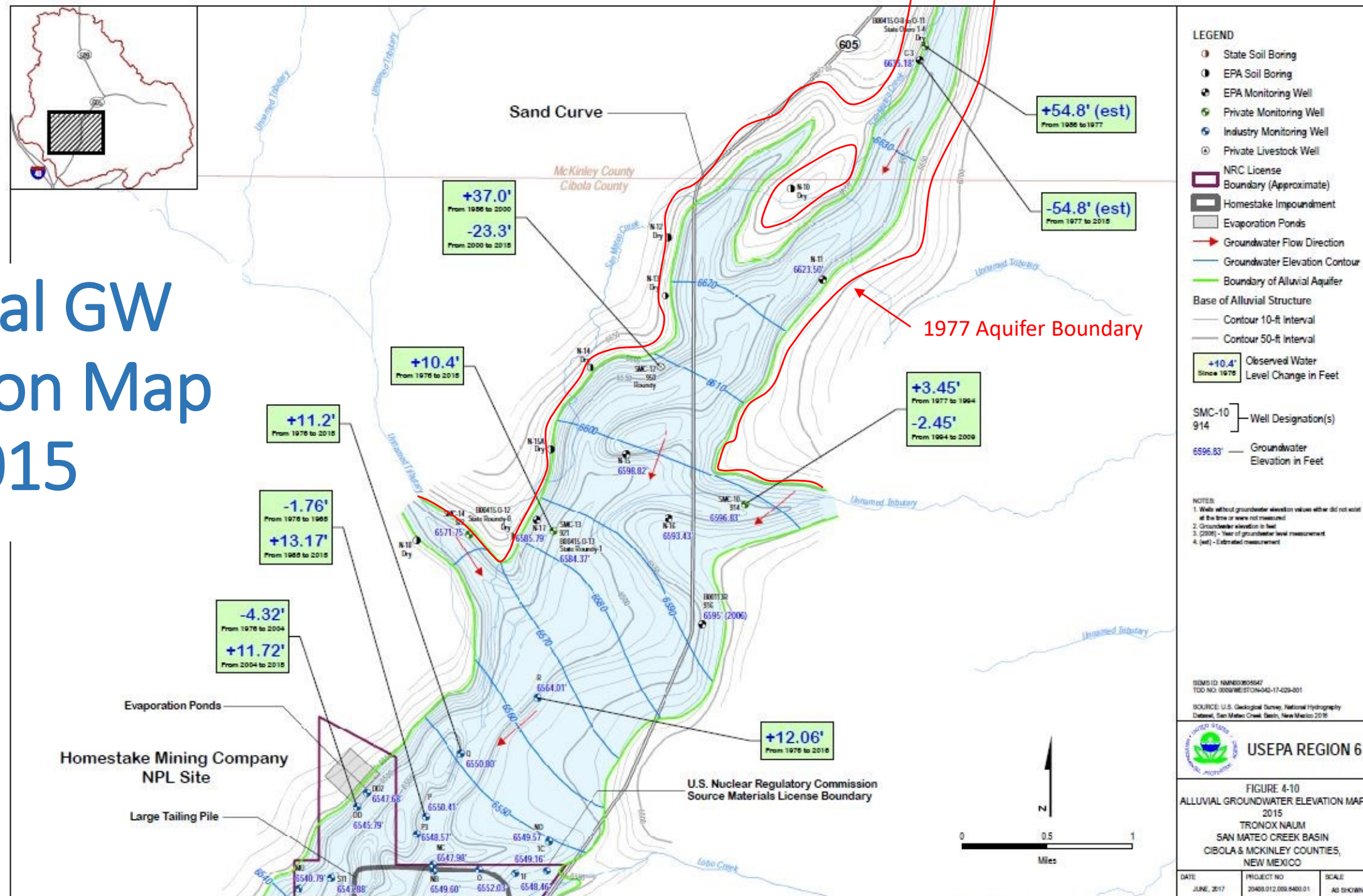


# Alluvial GW Elevation Map 1976-77





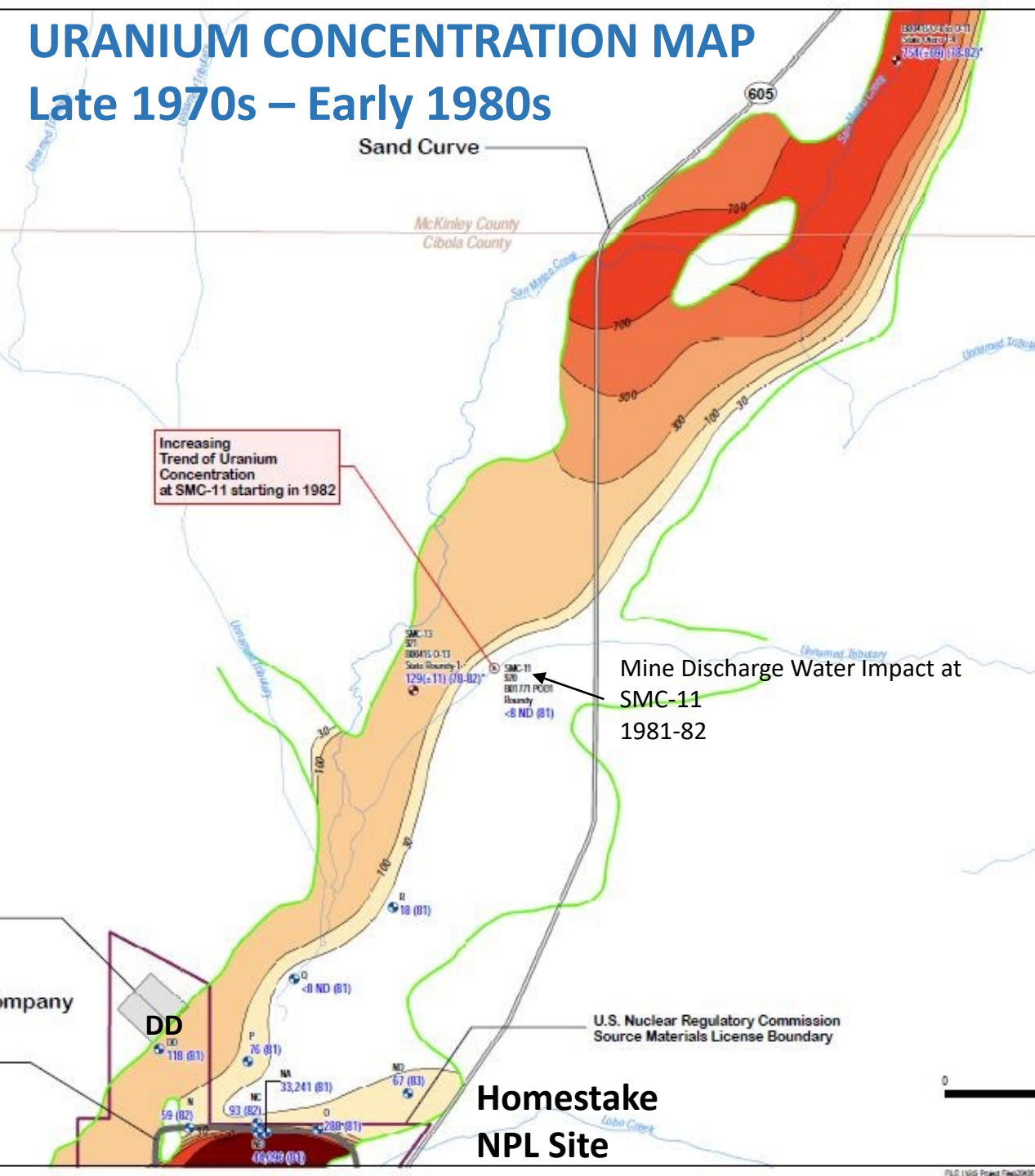
# Alluvial GW Elevation Map 2015





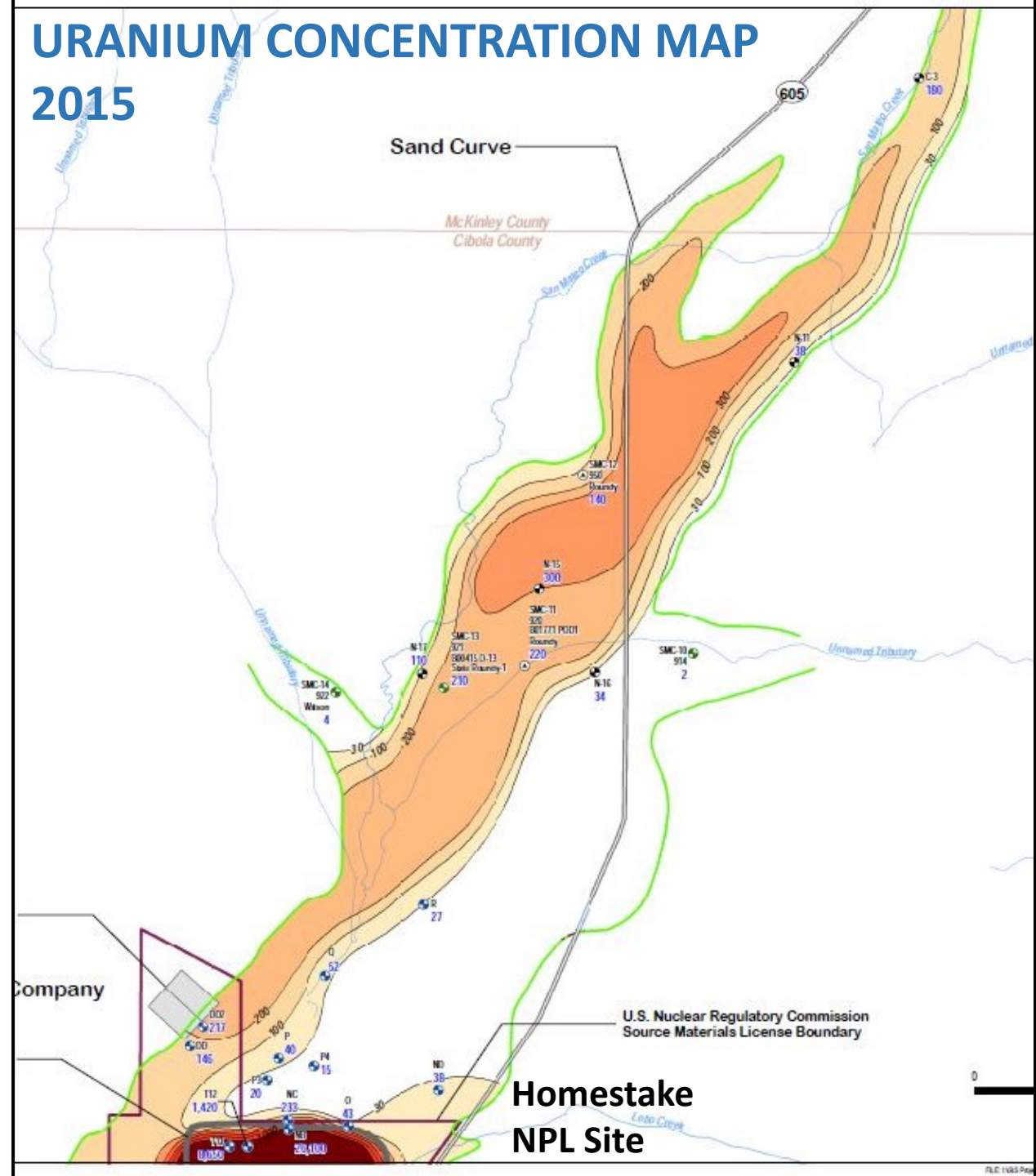
# URANIUM CONCENTRATION MAP

Late 1970s – Early 1980s

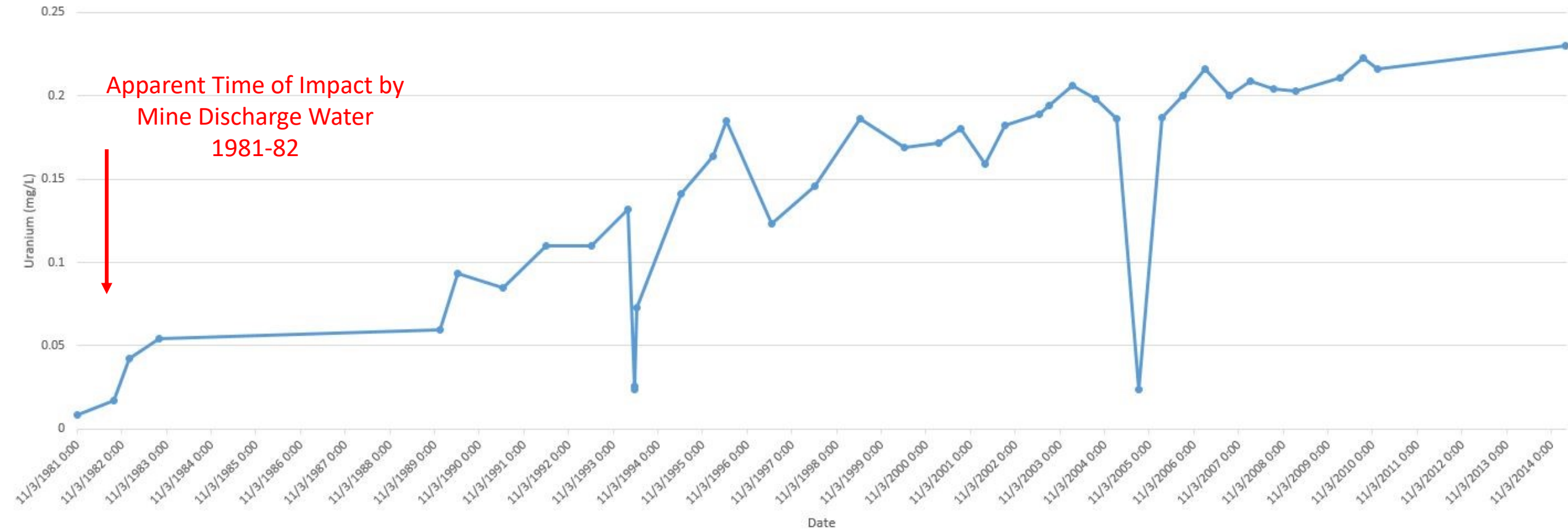


# URANIUM CONCENTRATION MAP

2015



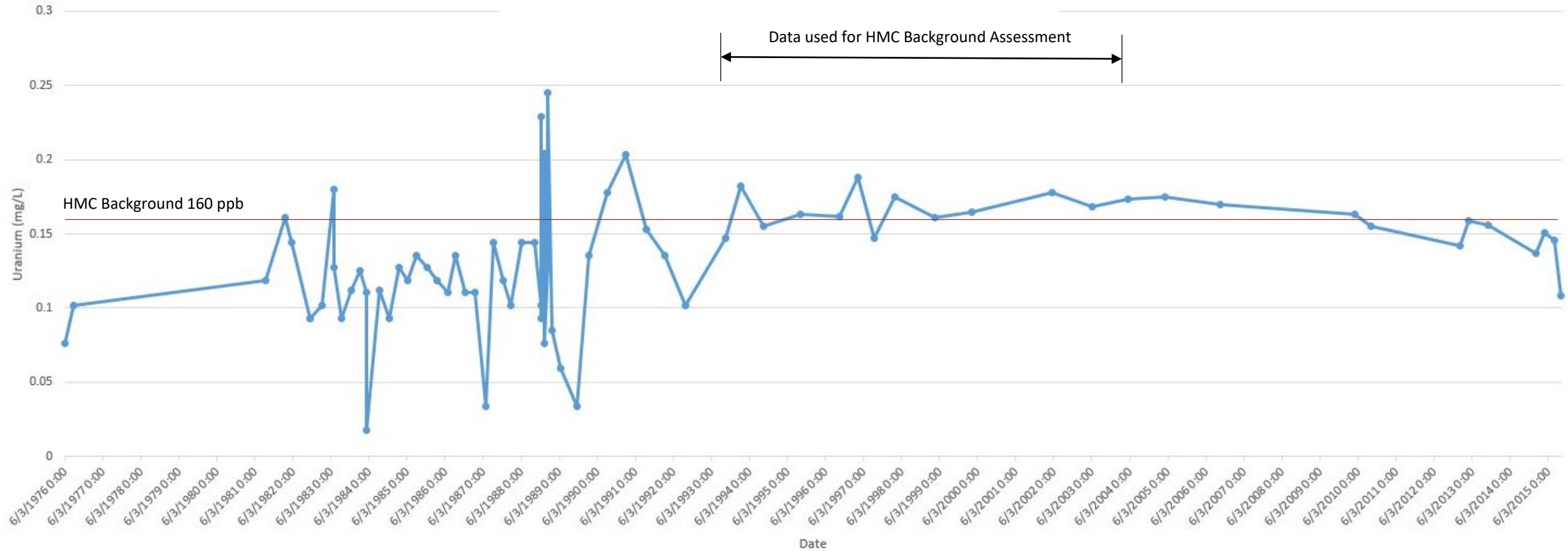
# Homestake Well 920 (SMC-11) Uranium-Time Trend Plot





# Homestake Well DD

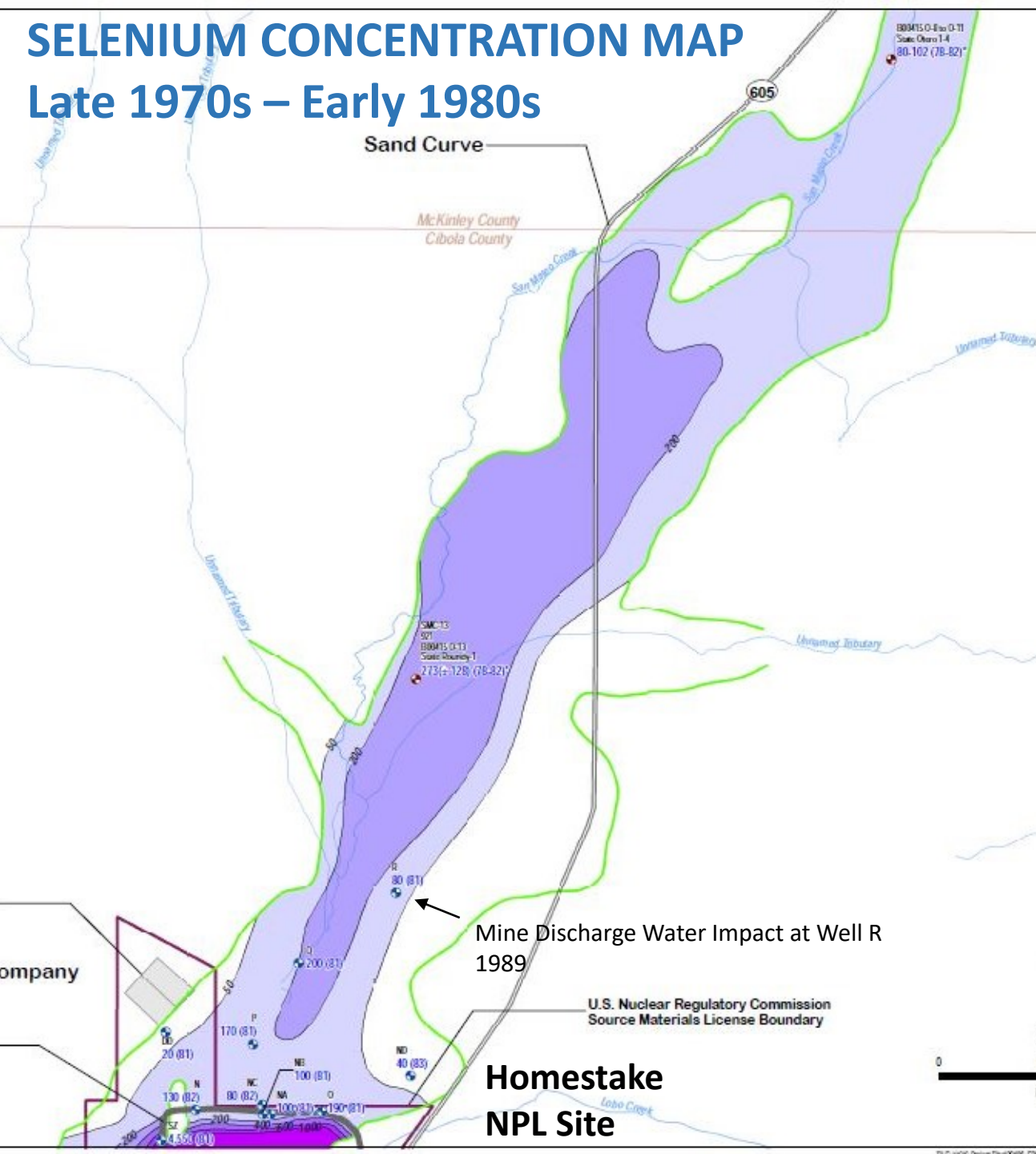
## Uranium-Time Trend Plot





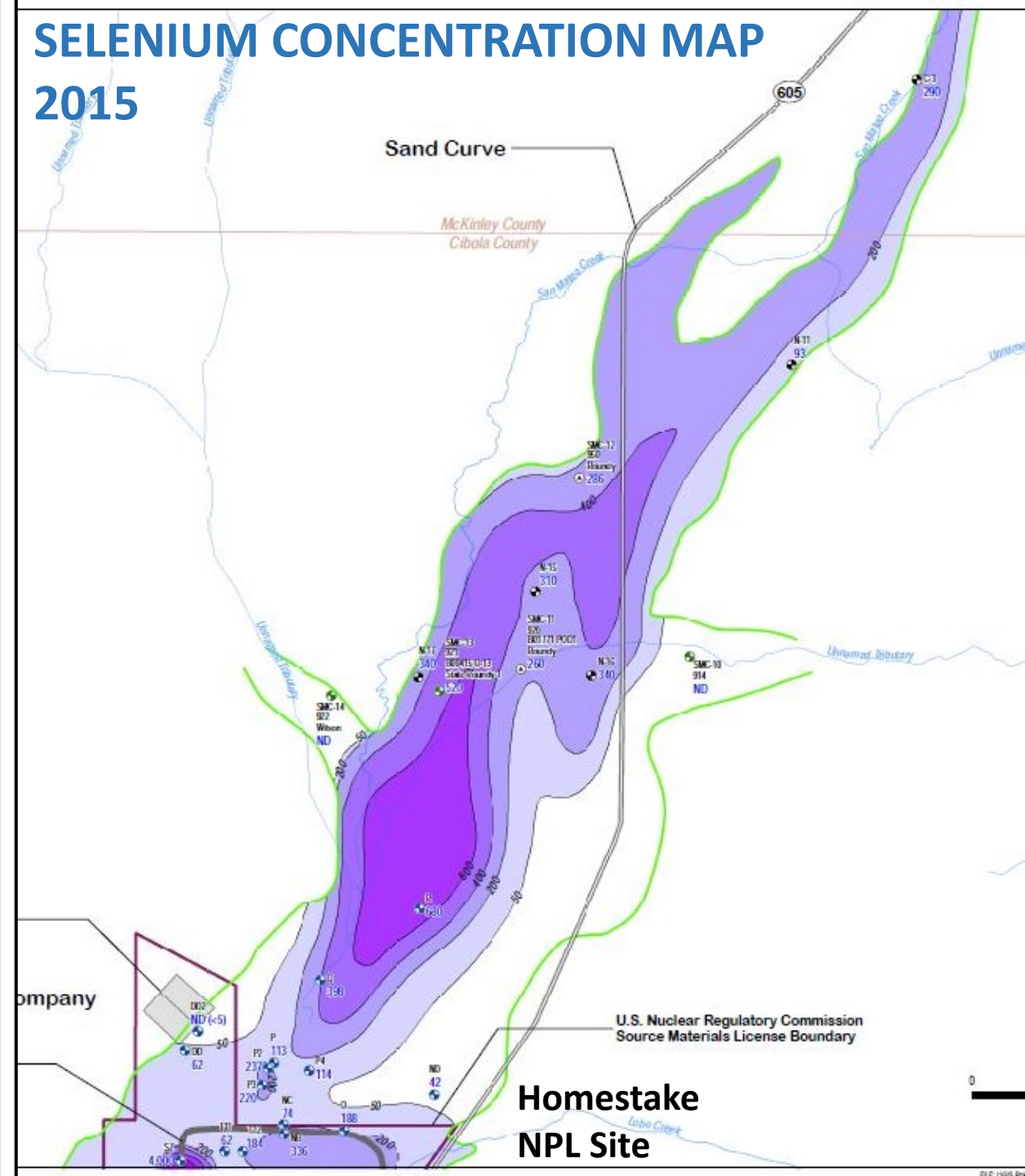
# SELENIUM CONCENTRATION MAP

Late 1970s – Early 1980s



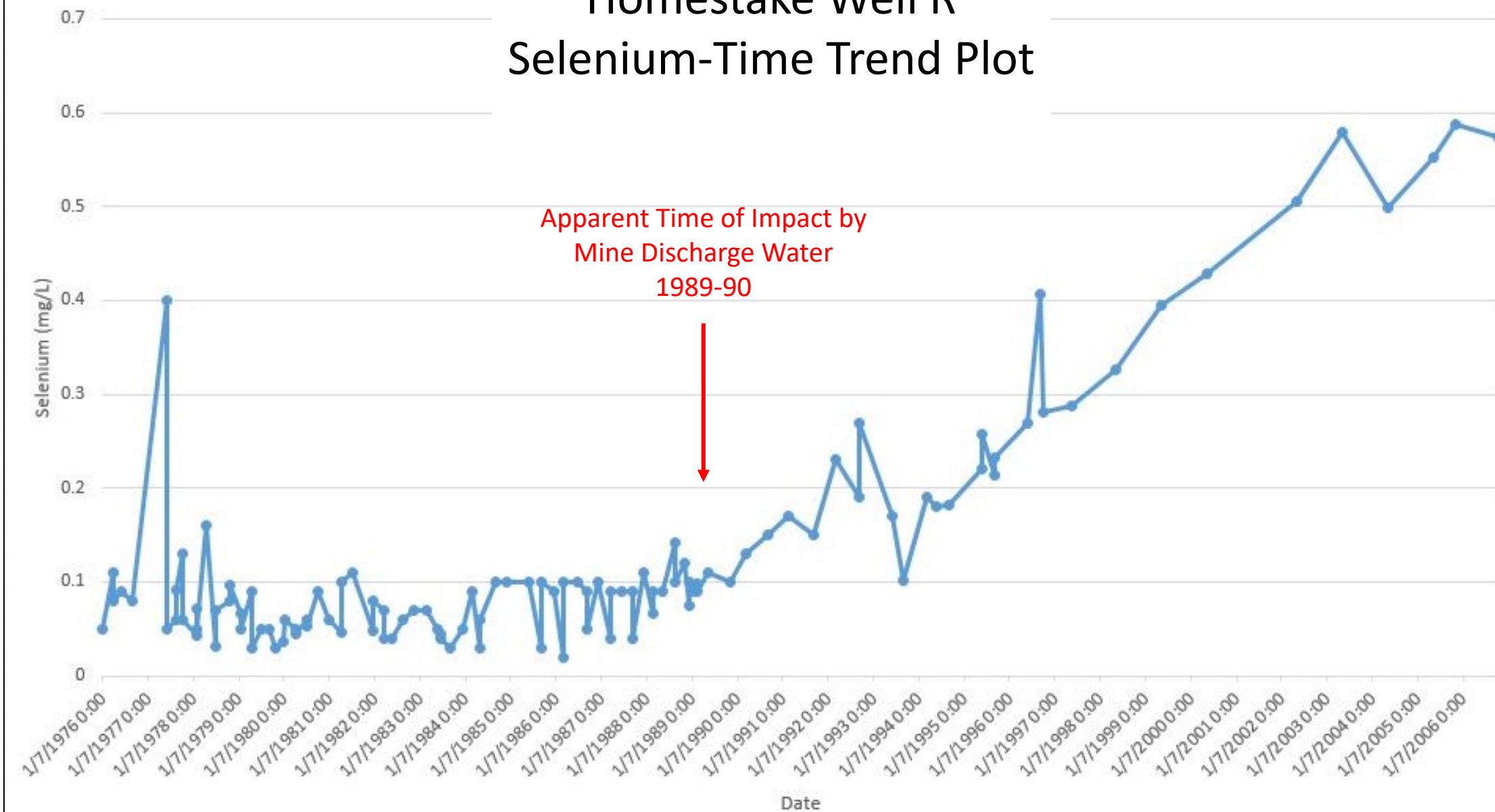
# SELENIUM CONCENTRATION MAP

2015

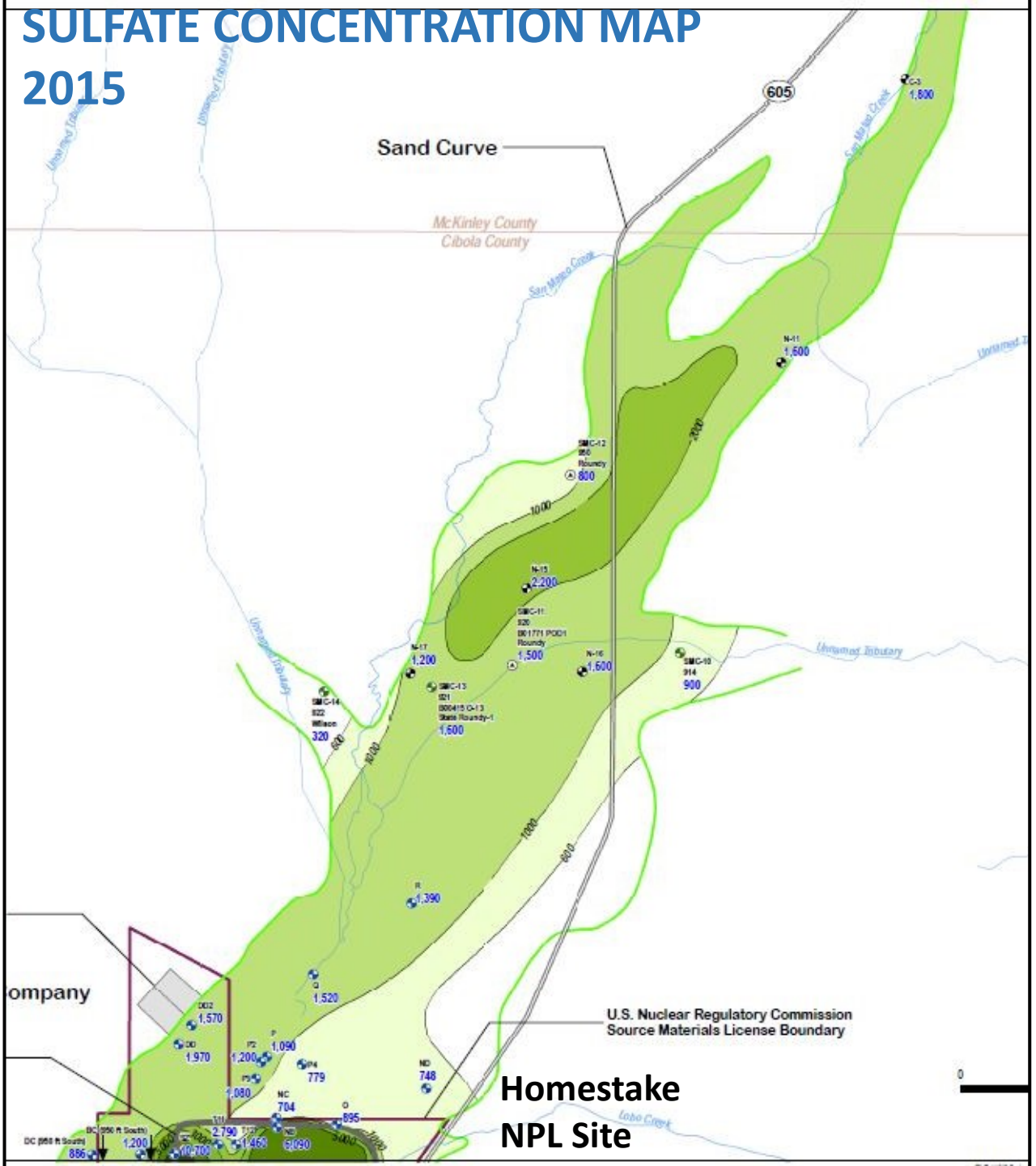
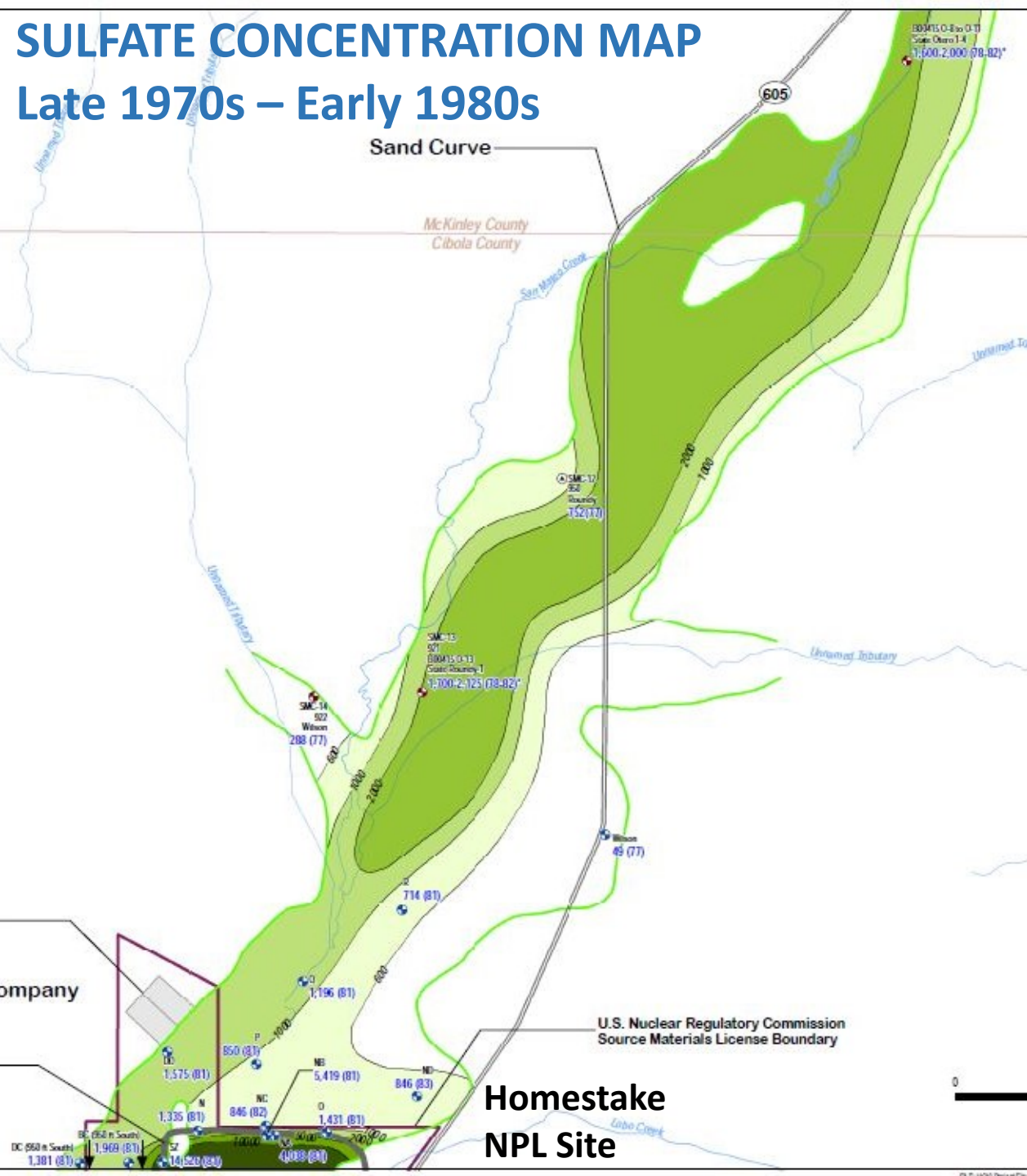




# Homestake Well R Selenium-Time Trend Plot

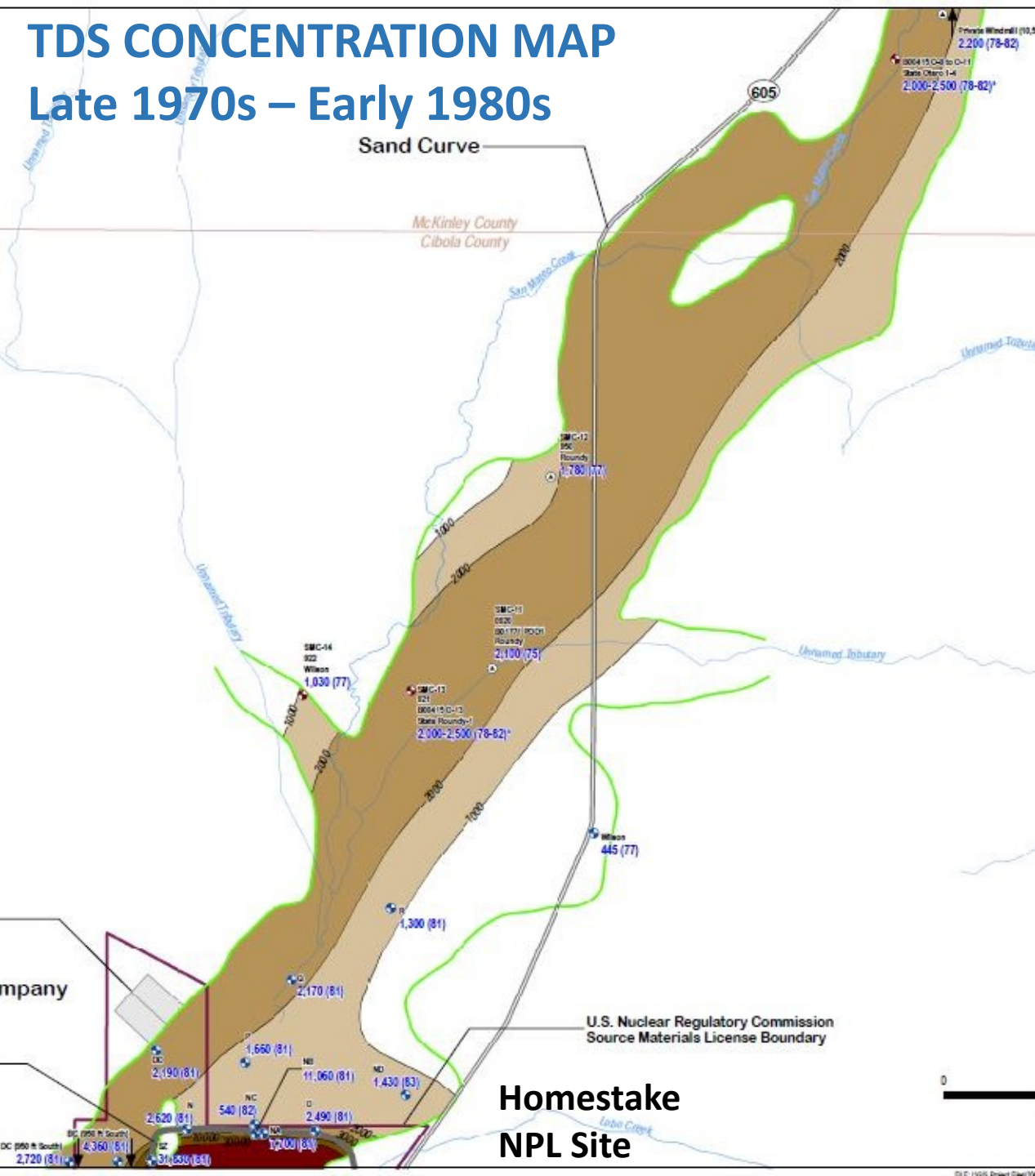






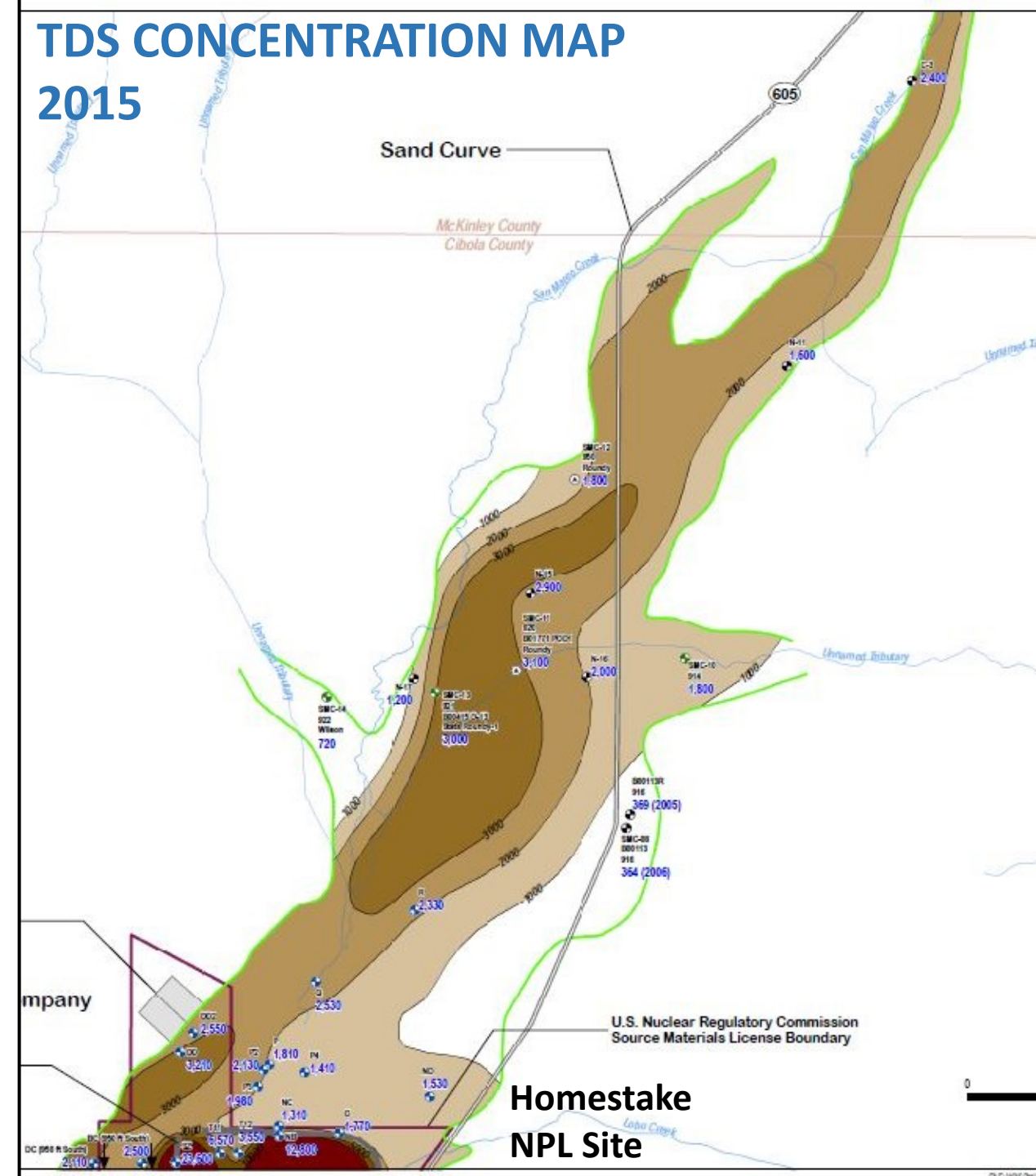
# TDS CONCENTRATION MAP

## Late 1970s – Early 1980s



# TDS CONCENTRATION MAP

## 2015





San Mateo Creek Drainage Basin

COUNTY ROAD 63

6550 ft

6540 ft

6530 ft

6520 ft

6510 ft

6500 ft

6490 ft

6480 ft

6470 ft

6460 ft

6450 ft

6440 ft

6430 ft

6420 ft

6410 ft

6400 ft

6390 ft

6380 ft

6370 ft

6360 ft

6350 ft

6340 ft

6330 ft

6320 ft

6310 ft

6300 ft

6290 ft

6280 ft

6270 ft

6260 ft

6250 ft

6240 ft

6230 ft

6220 ft

6210 ft

6200 ft

6190 ft

6180 ft

6170 ft

6160 ft

6150 ft

6140 ft

6130 ft

6120 ft

6110 ft

6100 ft

6090 ft

6080 ft

6070 ft

6060 ft

6050 ft

6040 ft

6030 ft

6020 ft

6010 ft

6000 ft

5990 ft

5980 ft

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5200 ft

5190 ft

5180 ft

5170 ft

5160 ft

5150 ft

5140 ft

5130 ft

5120 ft

5110 ft

5100 ft

5090 ft

5080 ft

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5040 ft

5030 ft

5020 ft

5010 ft

5000 ft

4990 ft

4980 ft

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4390 ft

4380 ft

4370 ft

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4290 ft

4280 ft

4270 ft

4260 ft

4250 ft

4240 ft

4230 ft

4220 ft

4210 ft

4200 ft

4190 ft

4180 ft

4170 ft

4160 ft

4150 ft

4140 ft

4130 ft

4120 ft

4110 ft

4100 ft

4090 ft

4080 ft

4070 ft

4060 ft

4050 ft

4040 ft

4030 ft

4020 ft

4010 ft

4000 ft

3990 ft

3980 ft

3970 ft

3960 ft

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3940 ft

3930 ft

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3290 ft

3280 ft

3270 ft

3260 ft

3250 ft

3240 ft

3230 ft

3220 ft

3210 ft

3200 ft

3190 ft

3180 ft

3170 ft

3160 ft

3150 ft

3140 ft

3130 ft

3120 ft

3110 ft

3100 ft

3090 ft

3080 ft

3070 ft

3060 ft

3050 ft

3040 ft

3030 ft

3020 ft

3010 ft

3000 ft

2990 ft

2980 ft

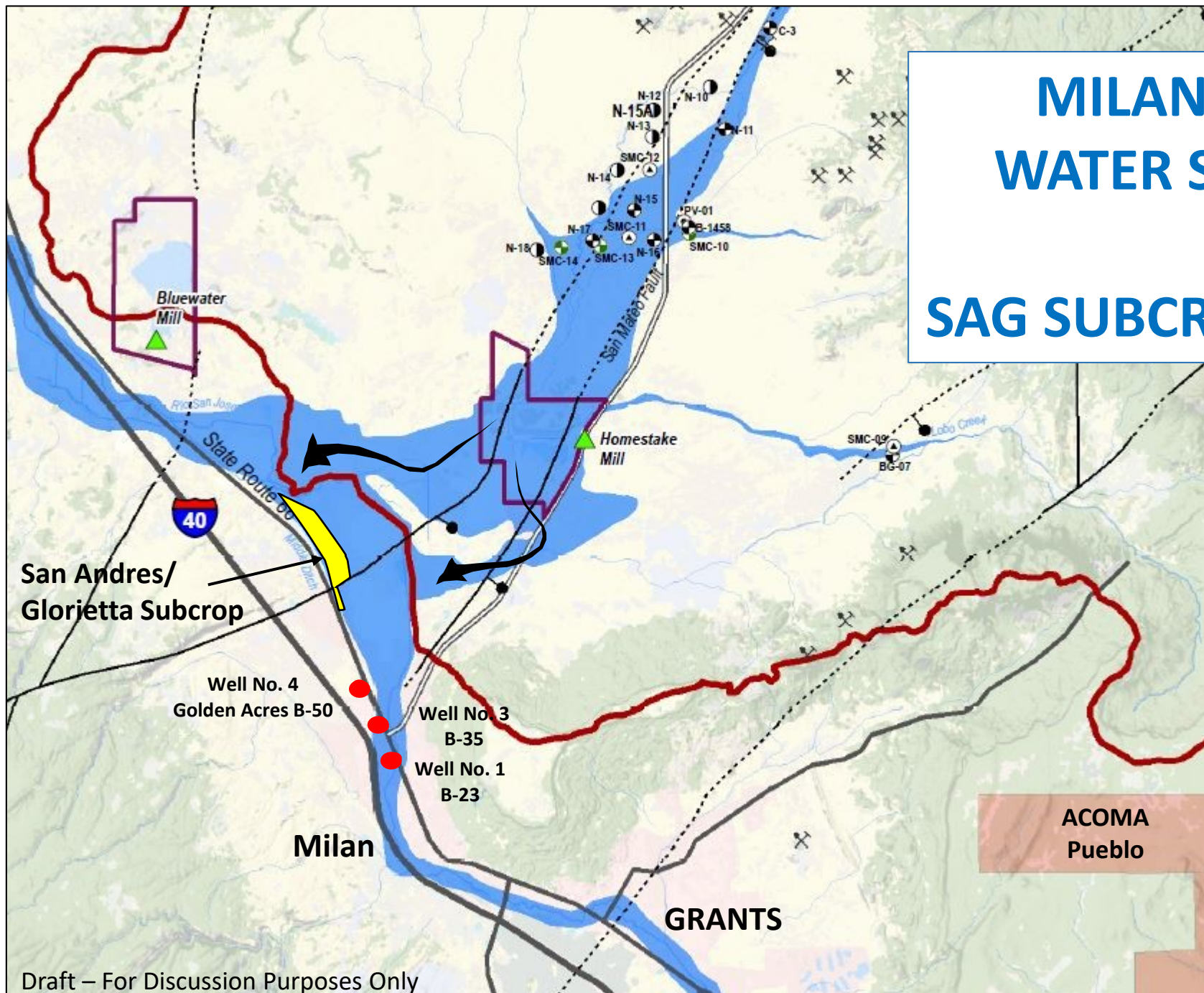
2970 ft

Modified from  
Homestake Mining Company  
Draft Correction Action Plan

Draft – For Discussion Purposes Only



# MILAN MUNICIPAL WATER SUPPLY WELLS and SAG SUBCROP TO ALLUIUM



● Water Supply Well

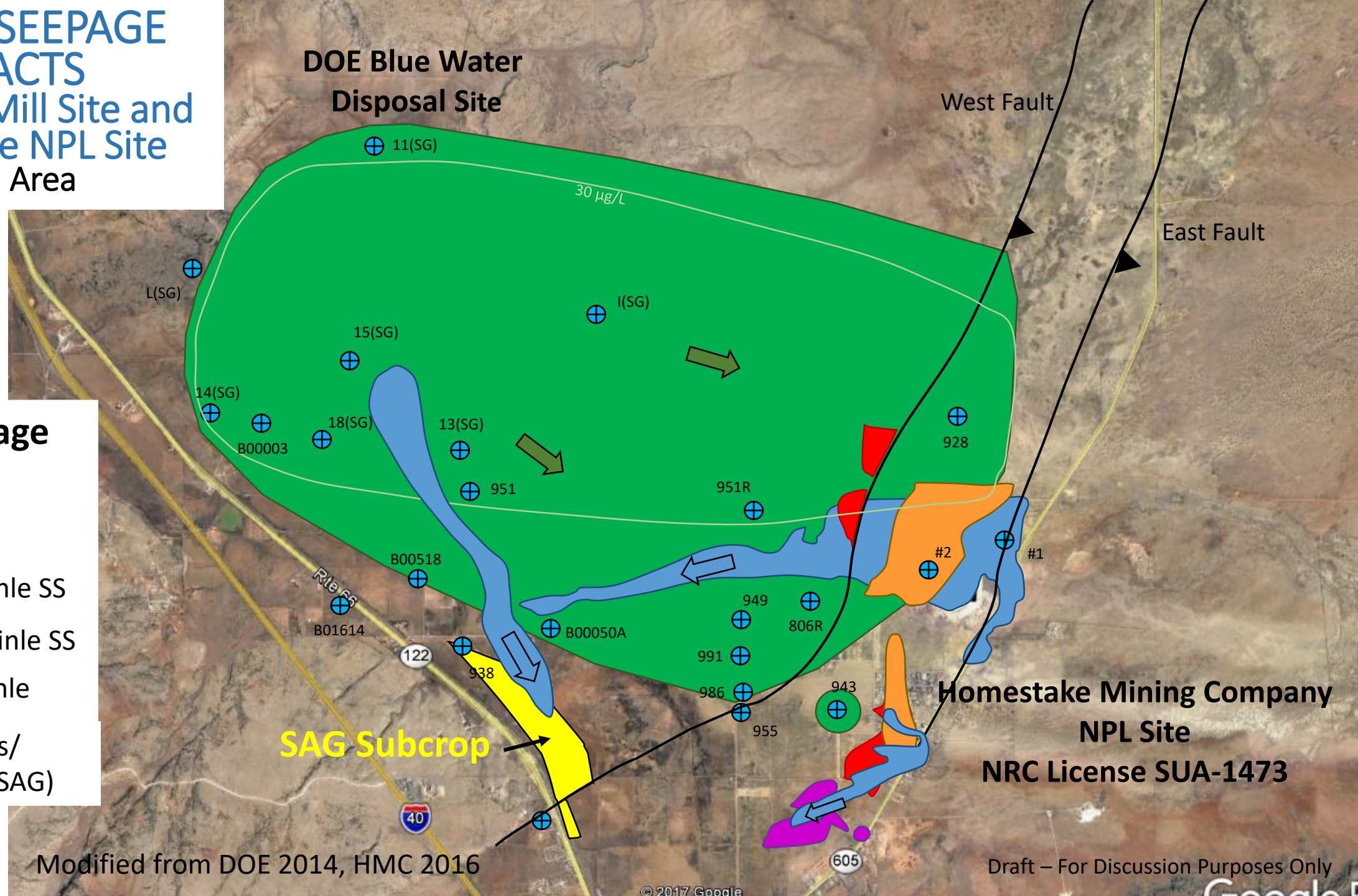


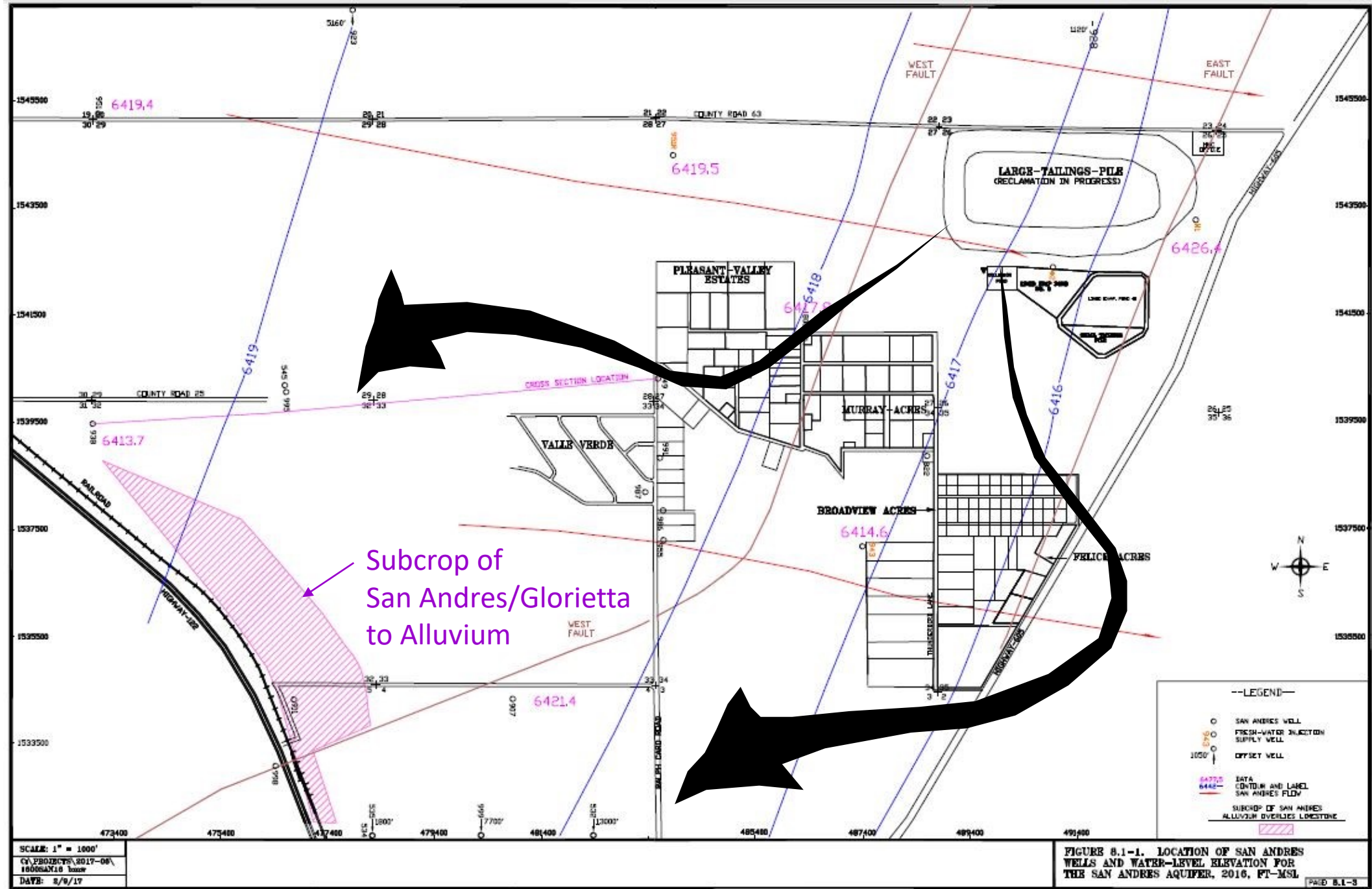
# TAILING SEEPAGE IMPACTS

## Bluewater Mill Site and Homestake NPL Site Milan Area

### Tailing Seepage Impact

- Alluvium
- Upper Chinle SS
- Middle Chinle SS
- Lower Chinle
- San Andres/  
Glorietta (SAG)

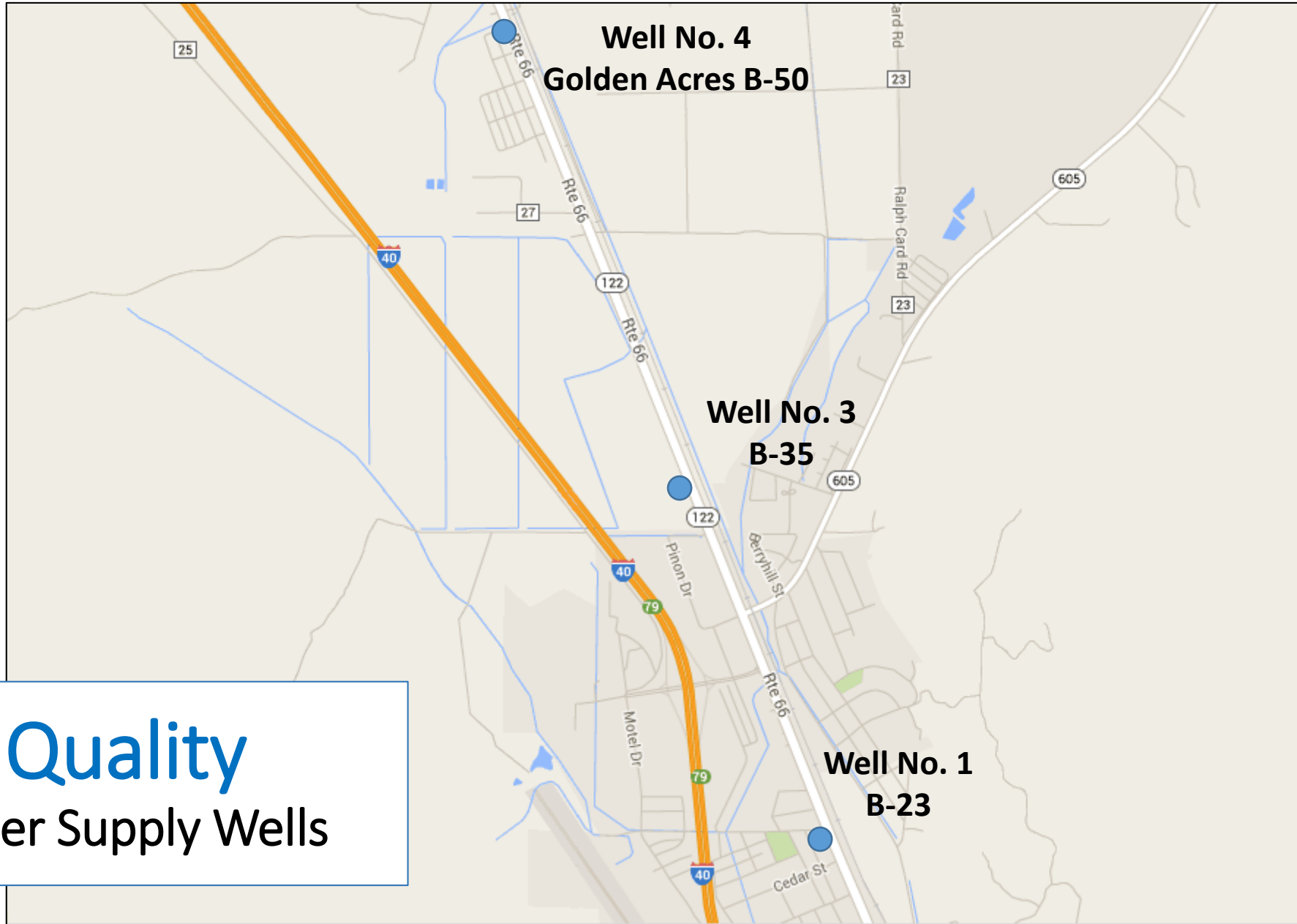






# Water Quality

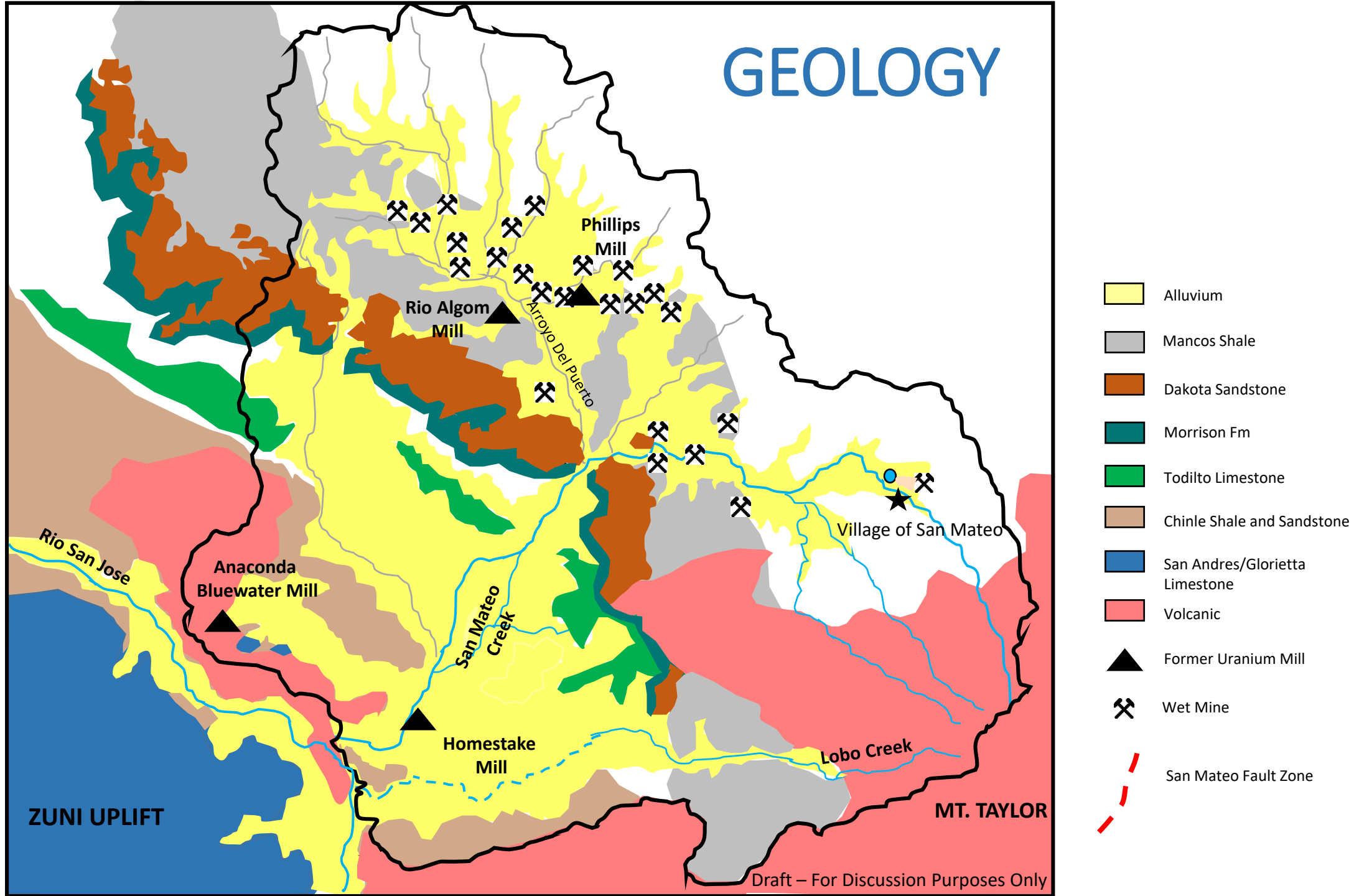
## Milan Water Supply Wells



# OTHER SLIDES



# GEOLOGY



# TAILING SEEPAGE FROM FORMER URANIUM MILL SITES IMPACT GROUND WATER



Ambrosia Lake Disposal Cell

## ■ UPPER BASIN - AMBROSIA LAKE AREA

- Rio Algom LLC Ambrosia Lake Facility
- DOE Ambrosia Lake Disposal  
UMTRCA Title I Site  
(Former Phillips/UNC Mill)

## ■ LOWER BASIN - MILAN AREA

- DOE Bluewater Disposal Site
- Homestake Mining Company NPL Site



Bluewater Disposal Cell